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May 1942

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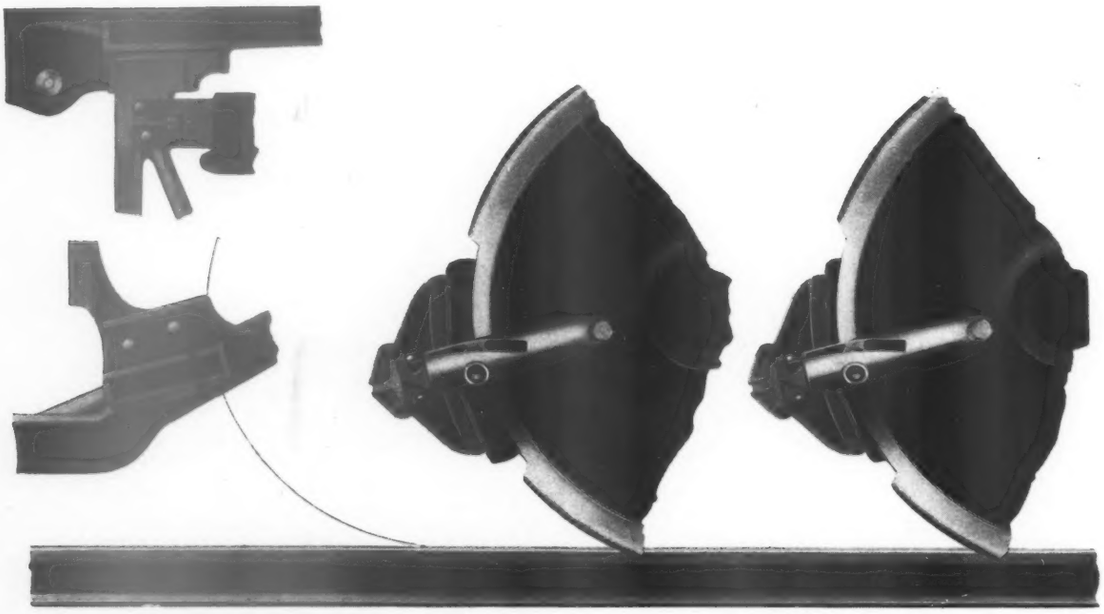

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MAY, 1942

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C. & O. 2-6-6-6 Locomotives

New heavy articulated locomotives are the first of their wheel arrangement. Tractive force, 110,200 lb.

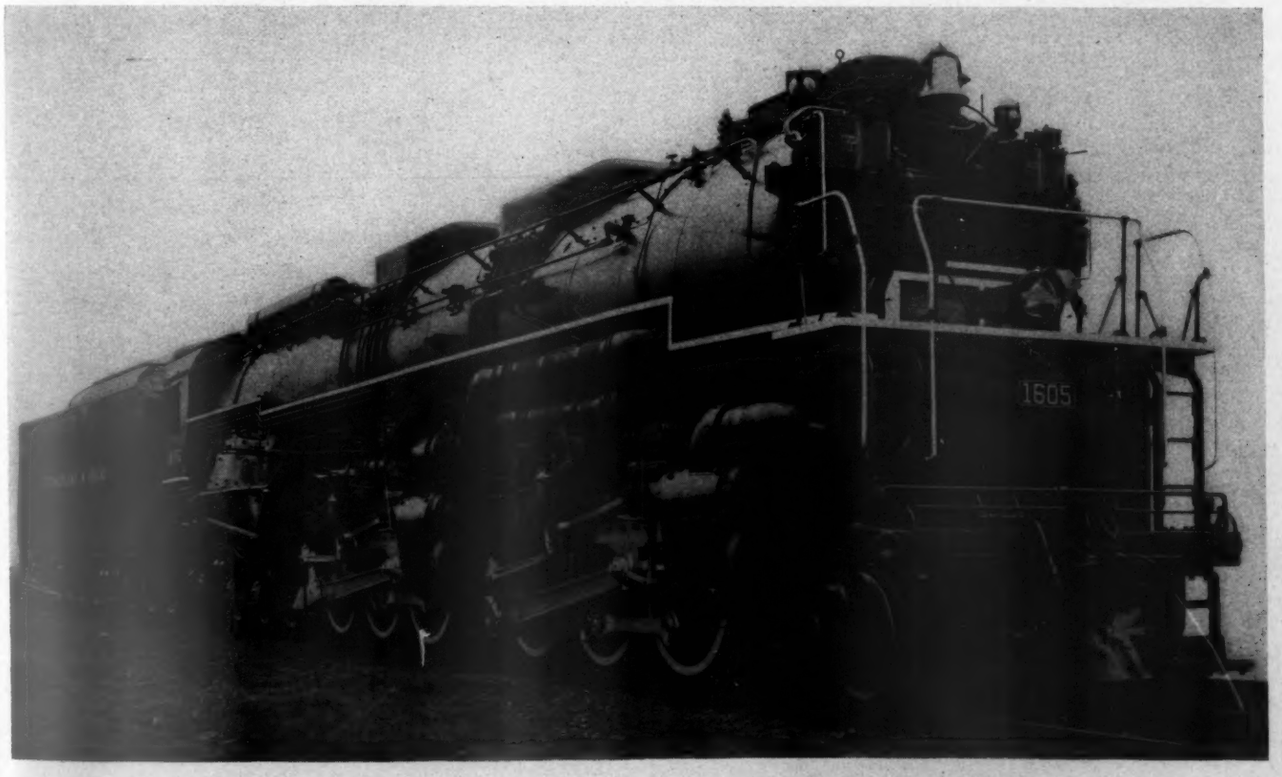
THE Chesapeake & Ohio has recently placed into service ten 2-6-6-6 type articulated locomotives which are the first of this wheel arrangement to be built. These have been designated as the Allegheny type by the railroad and were built by the Lima Locomotive Works, Inc.

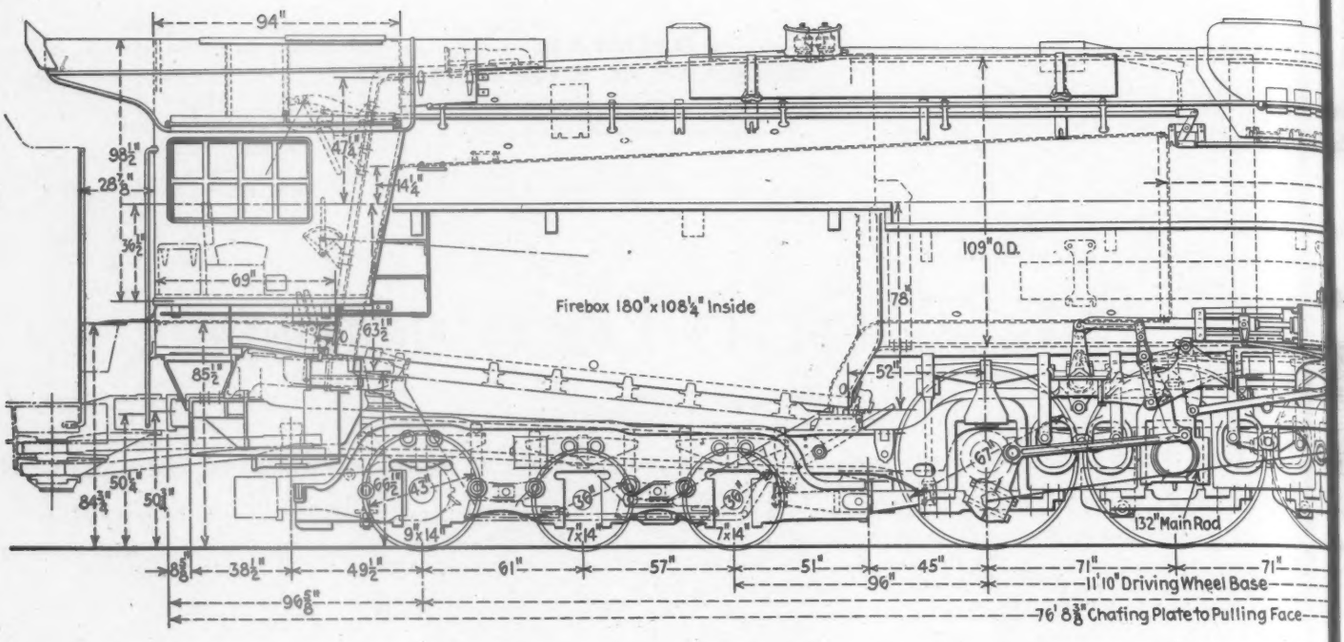
This new power is designed for operation over the heavy grades of the Allegheny mountains east of Hinton, W. Va., and will also be used to supplement the railroad company's 2-10-4 type now in operation west of Russell, Ky. The new locomotives have a tractive force of 110,200 lb. with a boiler pressure of 260 lb. and 67-in. drivers. The four cylinders are 22½ in. by 33 in. The principal weights and dimensions are shown in the accompanying tables and drawings.

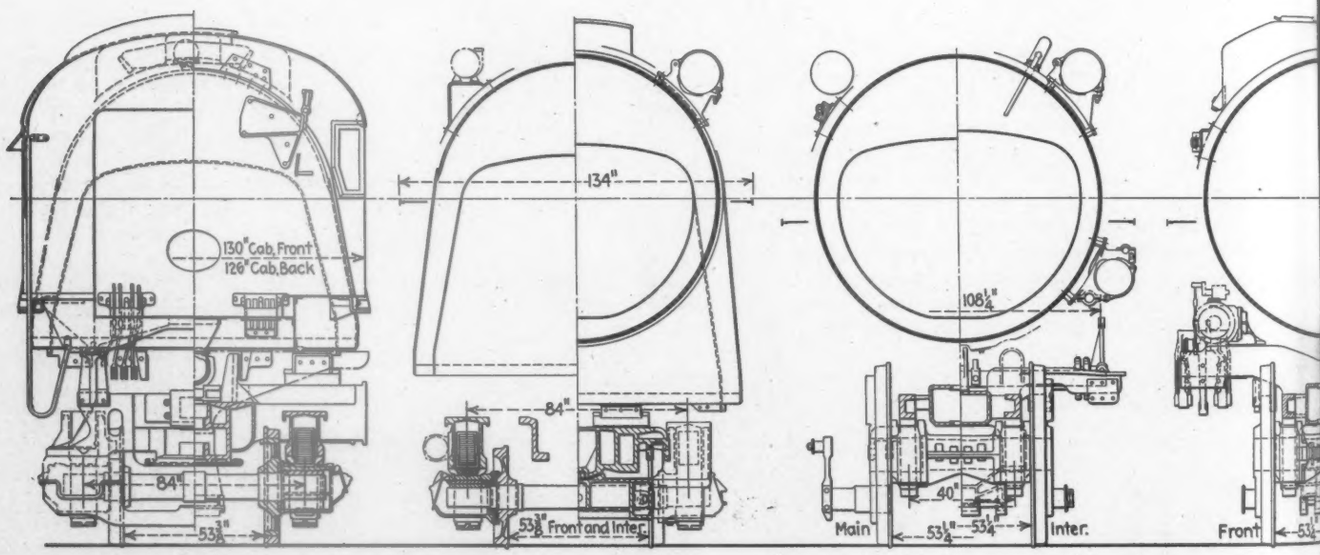
In the field of heavy motive power on the C. & O. these locomotives represent an interesting comparison with the Class H-7a articulated units built in 1924 and 1926 and the Class T-1 2-10-4 type built in 1930 for service on the west end of the road between Russell, Ky., and Toledo, Ohio. A comparison of the characteristics of these three classes with two other large six-coupled locomotives of high capacity appears in an accompanying table. While the Allegheny type locomotives are designed for maximum speeds of 60 m. p.h. the objective of the design is to develop maximum continuous power output at speeds of from 30 to 35 m. p. h. The steam distribution system has been designed with a view to full capacity operation with a minimum drop in steam pressure between the dome and the cylinders.

The Running Gear

The engine beds, supplied by the General Steel Castings Corporation embrace the cylinders, back heads,

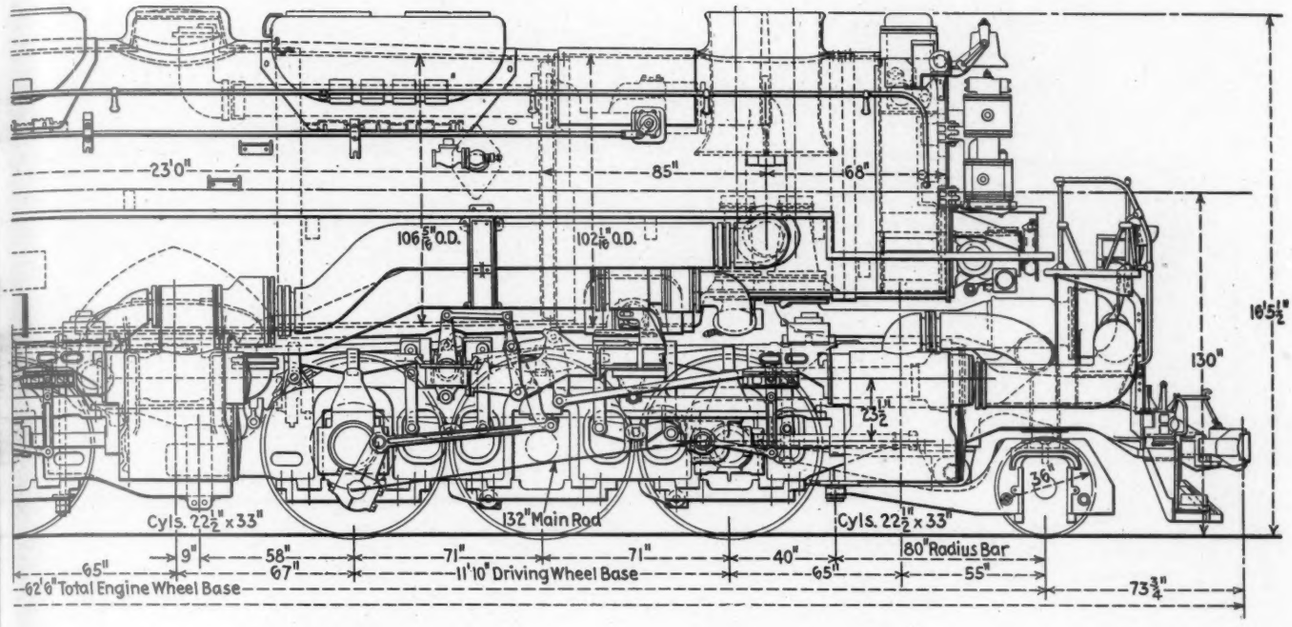


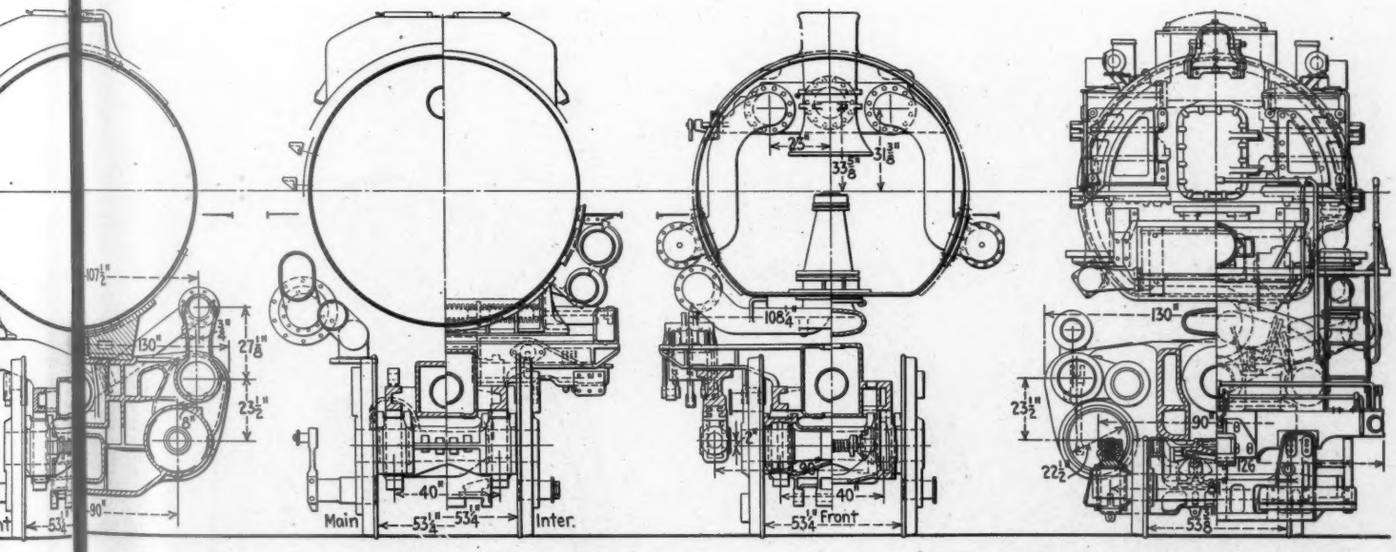




General Dimensions, Weights and Proportions of the C

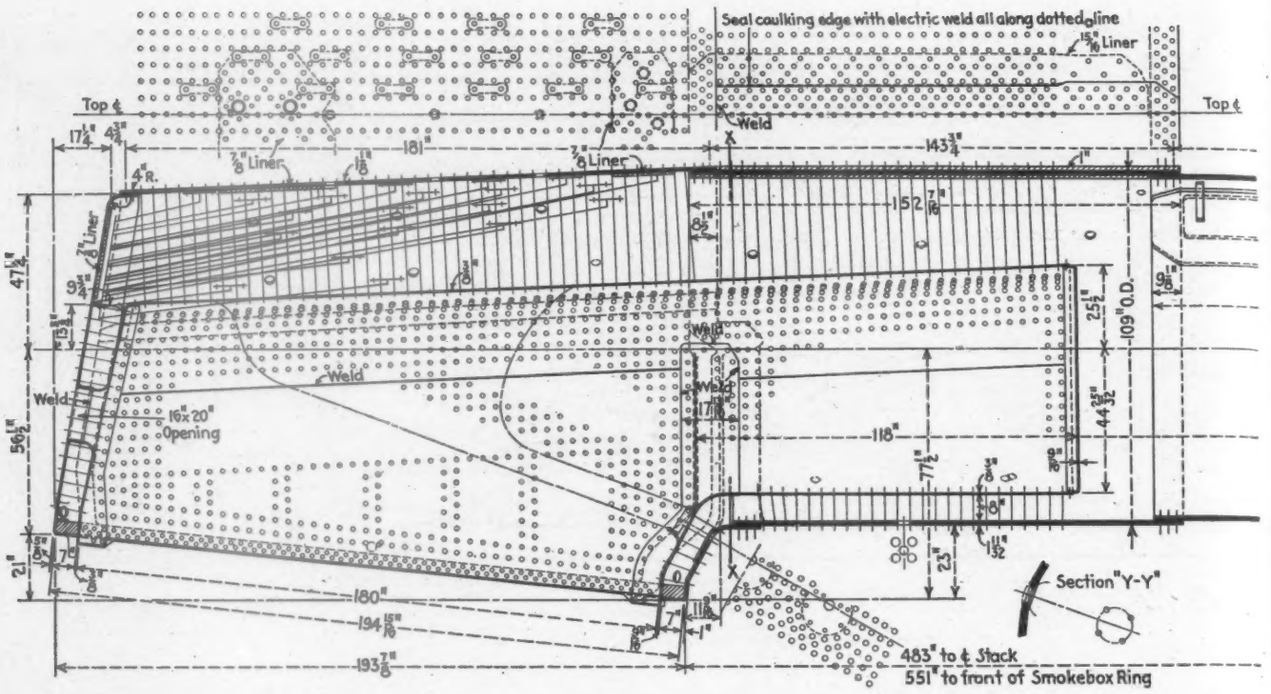
Builder	Lima Loco. Wks., Inc.
Type of locomotive	2-6-6-6
Road class	H-8
Road numbers	1600-1609
Date built	December, 1941
Service	Freight
Dimensions:	
Height to top of stack, ft.-in.	16- 5½
Height to center of boiler, ft.-in.	10-10
Width overall, in.	134
Cylinder centers, in.	90
Weights in working order, lb.:	
On drivers	471,000
On front truck	64,500
On trailing truck	189,000
Total engine	724,500
Tender (fully loaded)	(7) 426,100 (3) 437,600
Wheel bases, ft.-in.:	
Driving	34- 8
Rigid	71- 0
Engine, total	62- 6
Engine and tender, total	(7) 112-11 (3) 112- 6½
Wheels, diameter outside tires, in.:	
Driving	67
Wheels, diameter outside tires, in. (cont'd):	
Front truck	36
Trailing truck:	
Front and intermediate	36
Back	43
Engine:	
Cylinders, number, diameter and stroke, in.	4-22½x33
Valve gear, type	Baker
Valves, piston type, size, in.	12
Maximum travel, in.	8
Steam lap, in.	1 7/16
Exhaust clearance, in.	Line and line
Lead, in.	3/16
Cut-off in full gear, per cent	85
Boiler:	
Type	Conical
Steam pressure, lb. per sq. in.	260
Diameter, first ring, inside, in.	98
Diameter, largest, outside, in.	109
Firebox length, in.	180
Firebox width, in.	108⅛
Height mud ring to crown sheet, back, in.	70¼
Height mud ring to crown sheet, front of combustion chamber, in.	103
Combustion chamber length, in.	118
Thermic syphons, number	3

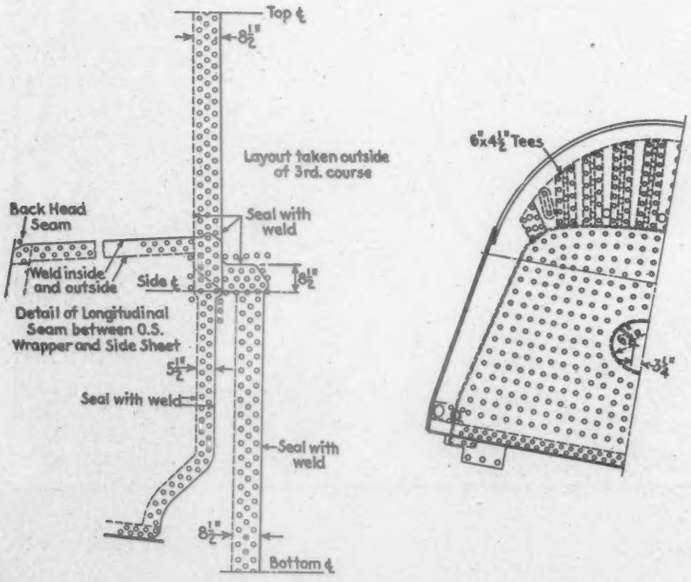




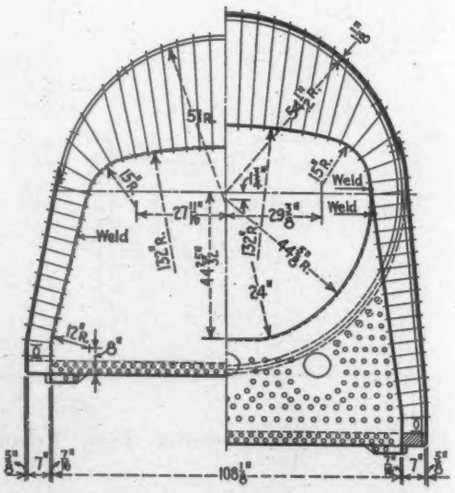
the Chesapeake & Ohio 2-6-6-6 Type Locomotives

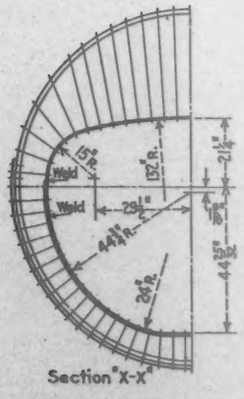
Boiler, (cont'd):	
Tubes, number and diameter, in.	48-2¼
Flues, number and diameter, in.	278-3½
Length over tube sheets, ft.-in.	23-0
Net gas area through tubes. and flues, sq. ft.	11.98
Fuel	Bituminous coal
Grate area, sq. ft.	135.2
Heating surfaces, sq. ft.:	
Firebox and combustion chamber	600
Thermic syphons	162
Firebox, total	762
Tubes and flues	6,478
Evaporative, total	7,240
Superheater	3,186
Combined evap. heating surface and superheater	10,426
Tender:	
Style or type	U-rectangular
Water capacity, gals.	25,000
Fuel capacity, tons	25
Trucks	Six and eight wheel
Journals, diameter and length, in.:	
Six wheel	7x14
Eight wheel	6½x12
General data, estimated:	
Rated tractive force, engine, 85 per cent, lb.	110,200
Speed at 1,000 ft. per min. piston speed, m.p.h.	36.25
General data, estimated, (cont'd):	
Piston speed at 10 m.p.h., ft. per min.	276
R.p.m. at 10 m.p.h.	50.1
Weight proportions:	
Weight on drivers + weight engine, per cent	65.1
Weight on drivers + tractive force	4.27
Weight of engine + evaporative heating surface	100.0
Weight of engine + combined heat. surface	69.5
Boiler proportions:	
Firebox heat. surface per cent comb. heat surface	7.3
Tube-flue heat. surface per cent comb. heat. surface	62.1
Superheater heating surface per cent comb. heat. surface	30.6
Firebox heat. surface + grate area	5.63
Tube-flue heat. surface + grate area	47.9
Superheater heating surface + grate area	23.6
Comb. heat. surface + grate area	77.1
Gas area, tubes-flues + grate area	.0886
Evaporative heating surface + grate area	53.5
Tractive force + grate area	815
Tractive force + evaporative heating surface	15.2
Tractive force + comb. heat. surface	10.57
Tractive force × diameter drivers + comb. heat. surface	708

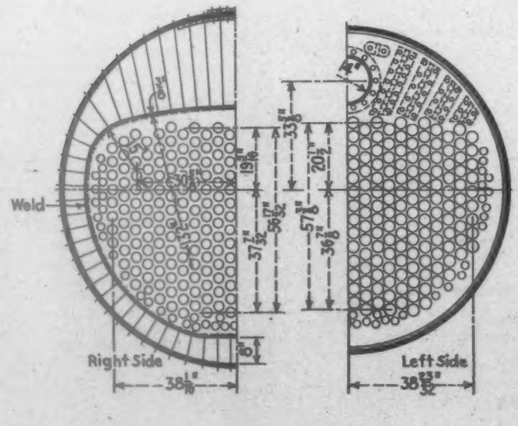

Seal caulking edge with electric weld all along dotted line
Top ℄
Weld
Liner
Liner
Liner
Liner
Weld
Weld
Weld
16"x20" Opening
Section "Y-Y"
483" to ℄ Stack
551" to front of Smokebox Ring

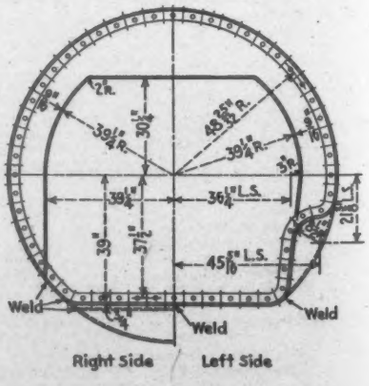

Top ℄
Layout taken outside of 3rd. course
Back Head Seam
Seal with weld
Weld inside and outside
Side ℄
Detail of Longitudinal Seam between O.S. Wrapper and Side Sheet
Seal with weld
Seal with weld
Bottom ℄

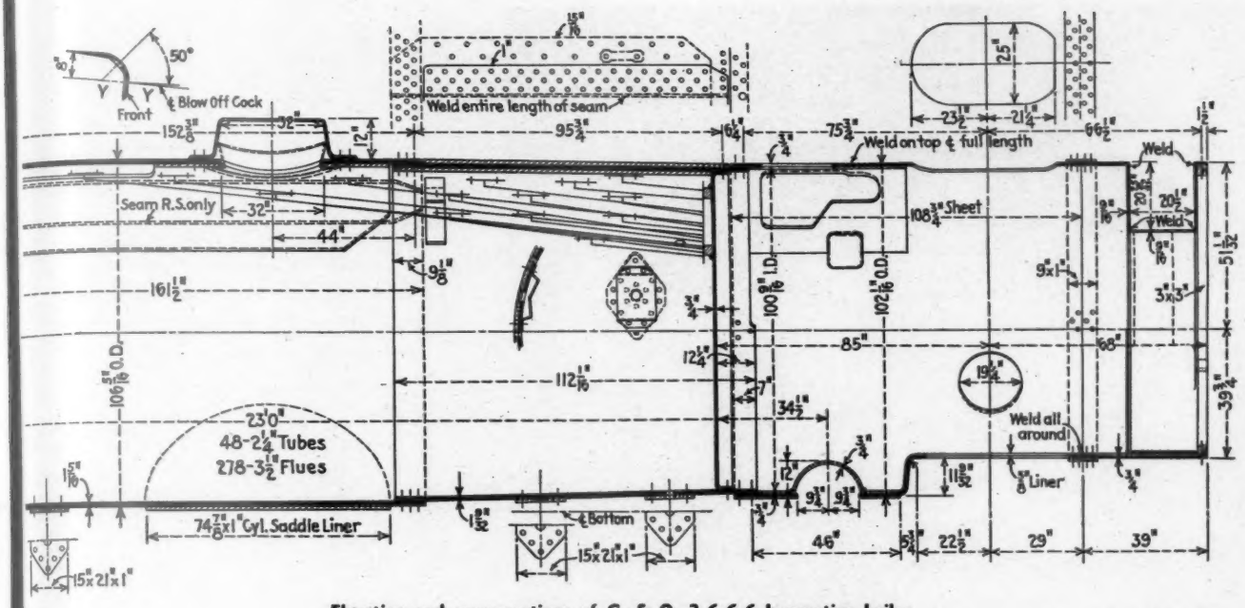
6"x4½" Tees


Weld
Weld
Weld


Weld
Weld
Section "X-X"


Weld
Right Side
Left Side


Weld
Weld
Weld
Right Side
Left Side



Elevation and cross-sections of C. & O. 2-6-6-6 locomotive boiler

Comparative Characteristics of Large C. & O. and Other Six-Coupled Locomotives

Railroad	C. & O.	C. & O.	C. & O	N. & W.	D. & R. G. W.
Wheel arrangement	2-6-6-6	2-10-4	2-8-8-2	2-6-6-4	4-6-6-4
Road class	H-8	T-1	H-7-A	A	L-105
Road numbers	1600-1609	3000-3039	1570-1589	1200-1201	3700-3709
Builder	Lima	Lima	Baldwin	R. R. Co.	Baldwin
Date built	1941	1930	1926	1936	1938
Service	Freight	Freight	Freight	Freight and Passenger	Freight
Weight on drivers, lb.*	471,000	373,000	504,500	430,100	437,940
Total engine weight, lb.*	724,500	566,000	584,600	570,000	641,900
Tender weight, lb.	426,100	415,000	376,340	378,600	394,000
Cylinders, diameter and stroke, in.	(4) 22½ x 33	(2) 29 x 34	(4) 23 x 32	(4) 24 x 30	(4) 23 x 30
Driving wheels, diameter, in.	67	69	57	70	70
Steam pressure, lb.	260	265	225	275	255
Fuel	Bit. coal	Bit. coal	Bit. coal	Bit. coal	Bit. coal
Grate area, sq. ft.	135.2	121.0	112.2	122.0	136.5
Firebox heat. surf. total, sq. ft.	600	477	467	530	613
Evap. heat. surf., sq. ft.	7,240	6,635.5	6,581	6,650	6,341
Super. surf., sq. ft.	3,186	3,030	1,885	2,703	2,628
Tractive force, engine, lb.	110,200	93,350	113,600	104,500	105,000
Tractive force, booster, lb.	None	15,275	None	None	None
Fuel capacity, tons	25	30	20	22	26
Water capacity, gals.	25,000	23,500	16,000	22,000	20,000

*Weights in working order.

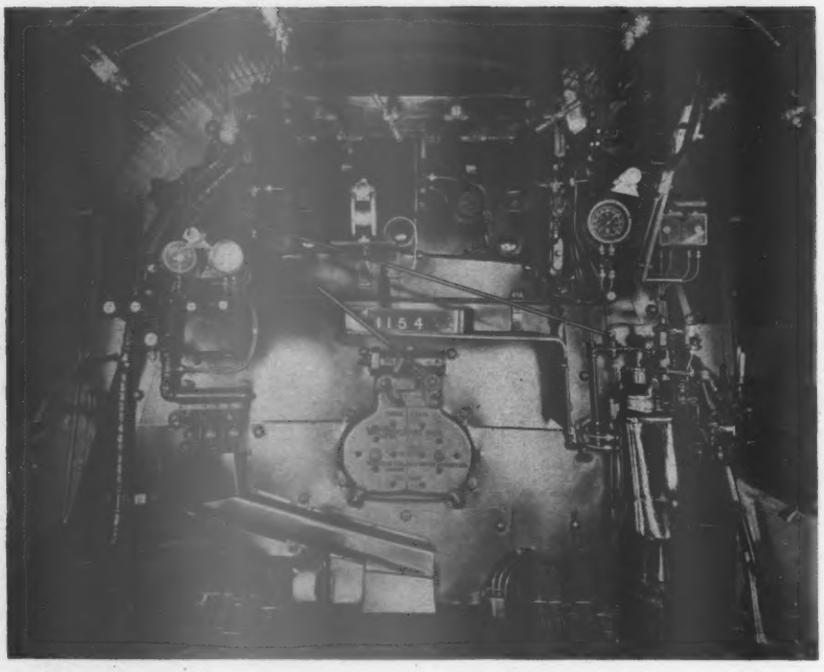
cradle, brake-hanger brackets, drawbar pockets, equalizer fulcrum pin supports, front deck, guide yoke, reverse-gear bracket and cold-water-pump bracket. The front and rear engine beds are connected at the rear cylinders by an articulation joint having a tongue cast on the front bed which fits into a pocket cast into the rear bed and secured by a hinge pin. The articulation hinge is fitted with bushings and has wear plates at the top and bottom of the pocket to insure the correct relation of the beds to each other. The hinge pin is mechanically lubricated.

The beds are designed with unusually large pedestal toes, alloy-cast-steel binders and nickel-chrome binder bolts and studs. The beds are fitted throughout with Ex-Cell-O bushings. Cast-steel frame shoes, with phosphor-bronze liners, are used to maintain the position of the roller-bearing housings in the pedestals.

A single boiler bearing of the sliding shoe type, in which is incorporated a coil-spring centering device, is used for transferring the weight of the boiler to the front engine. Sliding shoes are used at the four corners of the firebox; these are enclosed in oil-tight casings and are mechanically lubricated. In addition to these furnace bearers lateral bearers are used at the rear of the firebox.

The driving wheels are cast steel, of the conventional spoke type, with reinforced sections. They are fitted with 67-in. tires, set 53¼ in. at all driving wheels. The driving axles are hollow-bored, medium carbon steel and are mounted in Timken double roller bearings with split housings. The front drivers of each engine are equipped with the Alco lateral cushioning device.

The leading engine truck is the General Steel Castings Corporation's two-wheel outboard bearing type with 36-in. Armco rolled steel wheels mounted on medium-carbon-steel axles operating in Timken roller bearings. The six-wheel trailer truck was also supplied by the same manufacturer and is of the outboard bearing type with plain-bearing journal boxes. The trailer axles are medium carbon steel and the front and intermediate trailer axles are mounted with Armco 36-in. rolled-steel wheels while the back axle is fitted with 36-in. cast-steel centers and 43-in. tires. Rockers are used at the rear of the trailing truck with stops to limit the travel. The Timken lateral-control device is used over the front and intermediate trailer boxes. The rollers and plates



The cab is unusually roomy and the controls are well arranged

of this device are made of Timken steel and are not lubricated.

The cylinders, cast integral with the beds, have Hunt-Spiller gun-iron bushings and the piston and valve packing rings are the Hunt-Spiller combination rings. The pistons are cast steel with medium carbon-steel rods. The piston valves are 12 in. diameter, with 8-in. travel, actuated by Baker valve gear with Multiroll needle bearings, controlled in turn by an Alco Type H power reverse gear located on the rear engine. The front engine valve gear is controlled through a reach rod between the front and rear engines having universal joints and a crosshead located in the cylinder saddle. The crossheads are the multiple bearing type, of cast steel, with the bearing surfaces tin lined. The main and side rods are medium carbon steel with floating bushings of Hunt-Spiller iron and Magnus bronze at the main pin connections. The crank pins and knuckle pins are grease lubricated by the Alemite system.

In the counterbalancing of these locomotives 41.7 per cent of the weight of the reciprocating parts—2,152 lb. for each cylinder on each side—is balanced. There is an overbalance of 285 lb., 304 lb. and 309 lb. at the front, intermediate and main wheels respectively, of each engine unit. The dynamic augment at diameter speed is 16,380 lb.

The spring rigging is of conventional design. On the front engine it is continuous from the engine truck to the main driver; on the rear engine it is continuous on each side from the front driver to the rear trailer wheel. Coil buffer springs are used in the anchor hangers of the rear engine. Ex-Cello-O bushings are used throughout the spring rigging; the pins are not lubricated.

Two Nathan Type DV-7, 36-pint mechanical lubricators are located on the left side of the locomotive and furnish engine oil to the valve-rod crosshead guides, engine-truck center pin and pedestal faces, all driving-box pedestal faces, articulation hinge pin, furnace and boiler bearing shoes, radial buffer, and trailing truck hub and pedestal faces. Two Detroit 32-pint, Model B lubricators on the right side supply valve oil to the steampipe joints, cylinders, guides, exhaust-pipe joints, feedwater-heater pumps, air compressors and stoker engine. The terminal checks of the feed lines to the latter two auxiliaries are connected to Edna automatic lubricators for stand-by lubrication.

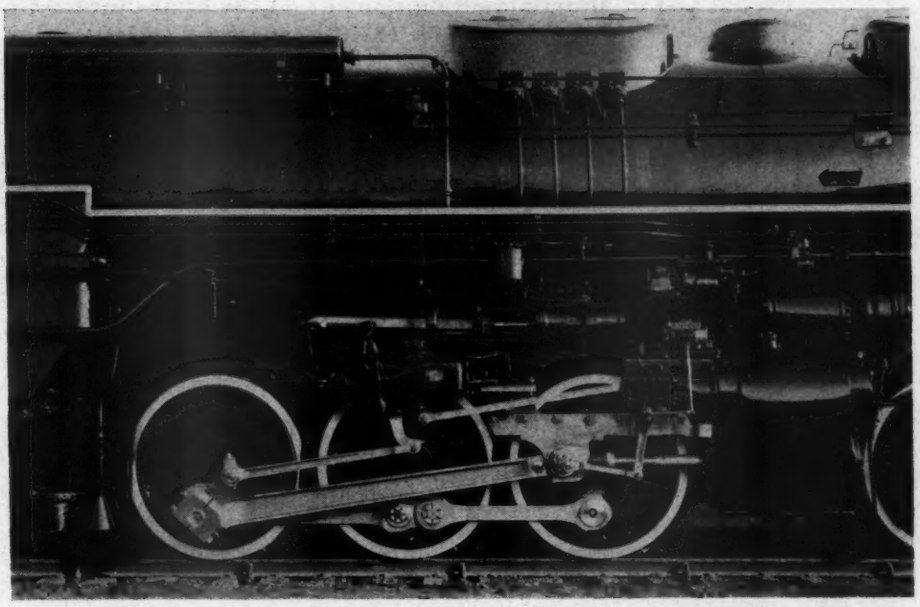
Alemite soft grease fittings are used on the ash-pan dump shaft, brake-hanger pins, brake-cylinder levers, driving-box inside flanges, lateral-cushioning devices, engine and trailing truck rockers, trailing-truck radius-bar seat, valve gear, reverse gear and reach rods, reverse-shaft bearings, rod knuckle pins, throttle rigging, valve-rod crosshead pins, stoker gear case, tender-truck swing-hanger pins, intermediate steam pipe, front engine exhaust pipe and feedwater-heater front exhaust pipe expansion joints. Alemite hard grease fittings are applied on the main crank pins, crosshead wrist pins, back ends of the eccentric rods and on the main and side rods. The reverse-shaft reach-rod crosshead arrangement between the front and rear engines is lubricated by manually filled oil cups. The driving-axle roller bearings are oil lubricated by means of housing reservoirs.

The Cab, Brake Equipment and Draft Gear

The cab is of all-welded construction, fitted with brass window sash and safety glass set in rubber. The windshields and clear-vision windows are also fitted with safety glass. The cab and deck are supported by cast steel brackets mounted on the frame cradle with expansion shoes under the rear of the cab and by the back furnace-bearer shoes at the front of the cab so that they are free to move with the boiler. Alemite lubrication is used on the sliding shoes. The cab is unusually roomy and the arrangement of all controls, gages, etc., is such as to contribute to easy and safe handling.

In addition to the driver brakes there is also single-shoe brakes on the rear trailer wheels operated by cylinders on the outside of the truck frame. The locomotive equipment is the Westinghouse No. 8 ET, with pedestal-type cab brake valves and two 8½-in. No. 150-D compressors located on the smoke box front. The compressors are operated by saturated steam and exhaust to the rear of the stack.

The locomotives are equipped with General Steel



Arrangement of the running gear of the rear engine—Both sets of valve motion are operated from a single power reverse gear

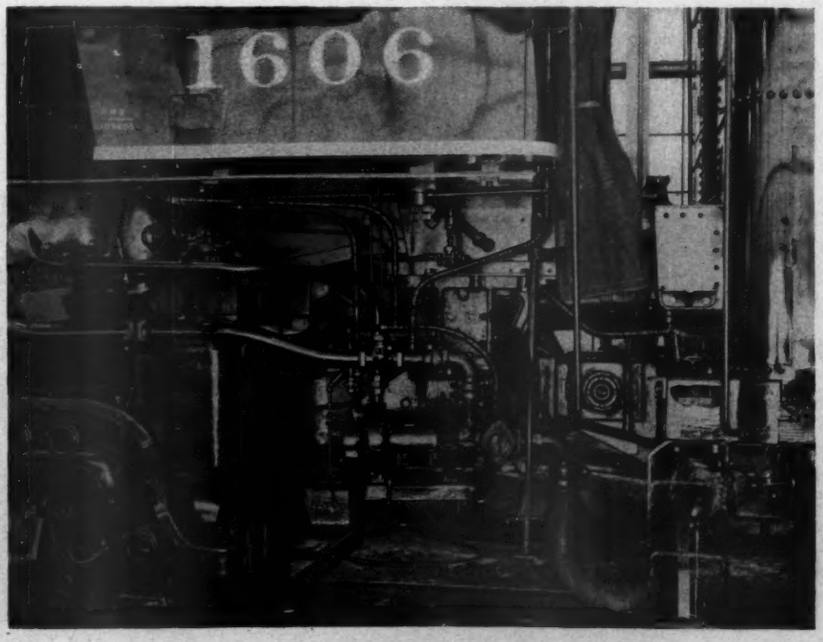
Castings Corporation's cast-steel pilot; Symington-Gould Type E coupler; Franklin Type E-2 radial buffer; Pyle-National headlight and classification lamp equipment, including headlight generator; Barco flexible connections between engine and tender as well as on air pumps and aftercooler, power reverse gear, blow-off-cock muffler and headlight generator. Byers extra-heavy wrought iron piping is used on engine and tender. Two sand boxes, with Viloco sander equipment, are used, one for each engine.

The Boiler

The boiler has an over-all length of 45 ft. 11 in. and is constructed with three barrel courses. The first course is conical, with an inside diameter of 98 in. at the front. The third course, which surrounds the combustion chamber has an outside diameter of 109 in. Both shell and firebox sheets are of carbon steel. The three shell courses have sheets $1\frac{9}{32}$ in., $1\frac{5}{16}$ in. and $1\frac{11}{32}$ in. thick, respectively. The firebox roof sheet is $1\frac{1}{8}$ in. thick. The longitudinal shell course seams are designed, with an efficiency of 86.1 per cent, with a view to reducing stress concentration to a minimum. The seams are triple riveted and caulked inside and outside.

The combustion chamber is 118 in. long and the firebox 180 in. long by $108\frac{1}{8}$ in. wide. The crown sheet has an approximate length of 25 ft. and a total slope, from front to back, of $11\frac{3}{4}$ in.

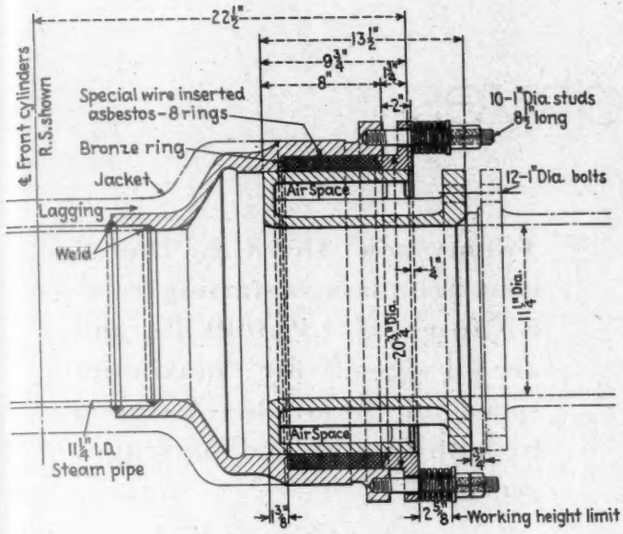
There is a full installation of flexible bolts around the combustion chamber. Flannery Type K and KJ bolts are used in the breaking zone of the side sheets; in the two boundary rows of the side sheets and of the back head. Flannery Type CK expansion stays are used at the 27 front rows of the combustion chamber, 9 rows wide. The water space rigid bolts are Alco Type P and PH.



The cold-water pump for the feedwater heater and the engine-tender connections

Partial List of Material and Equipment on the Lima-Built 2-6-6-6 Type Locomotive for the Chesapeake & Ohio

Bed frames; bumper; pilots; engine and trailer trucks	General Steel Castings Corp., Eddystone, Pa.
Engine bed bushings	Ex-Cell-O Corporation, Detroit, Mich.
Driving axles—engine and trailer truck	Carnegie-Illinois Steel Corp., Pittsburgh, Pa.
Semi-elliptic and coil spring	Pittsburgh Spring & Steel Co., Pittsburgh, Pa.
Trailer-truck lateral centering device	The Timken Roller Bearing Co., Canton, Ohio
Lateral motion devices	American Locomotive Co., New York
Radial buffers	Franklin Railway Supply Co., Inc., New York
Drawbars; safety bars; drawbar pins	Ewald Iron Co., Louisville, Ky.
Wheels—engine and trailer truck	American Rolling Mill Co., Middletown, Ohio
Wheel centers	Lima Locomotive Works, Inc., Lima, Ohio
Tires	American Locomotive Co., Railway Steel Spring Division, New York
Journal-box lids—trailer truck	National Malleable and Steel Castings Co., Cleveland, Ohio
Coupler, pilot	Symington-Gould Corp., Rochester, N. Y.
Uncoupling rigging	Standard Railway Equipment Company, Chicago
Draft gear	W. H. Miner, Inc., Chicago
Air brakes; air-compressor aftercooler	Westinghouse Air Brake Co., Wilmerding, Pa.
Brake shoes; brake-shoe keys	American Brake Shoe & Foundry Co., New York
Foundation driving brake	American Brake Company, St. Louis, Mo.
Cylinder and boiler lagging	Johns-Manville Sales Corp., New York
Cylinder and boiler jacket	American Rolling Mill Co., Middletown, Ohio
Piston-rod and valve-stem packing	T-Z Railway Equipment Co., Chicago
Duplex combination (bronze and iron) cylinder and valve-packing rings; cylinder and piston-valve bushings; valve-chamber bushings; main rod floating bushings; piston-rod packing rings	Hunt-Spiller Manufacturing Corporation, Boston, Mass.
Cylinder-cock operating valves	The Okadee Company, Chicago
Main-rod floating bushings; rod bushings; rod brasses	Magnus Metal Div., National Lead Co., New York
Valve gear	Pilliod Company, New York
Reverse gear	American Locomotive Co., New York
Crossheads	Ohio Steel Foundry Co., Lima, Ohio
Mechanical lubricator, dividers and terminal checks for engine oil	Nathan Manufacturing Co., New York
Mechanical lubricator and terminal checks for valve oil	Detroit Lubricator Co., Detroit, Mich.
Grease fittings	The Prime Manufacturing Co., Milwaukee, Wis.
Boiler and firebox plates	Lukens Steel Co., Coatesville, Pa. Otis Steel Company, Cleveland, Ohio
Arch brick	General Refractories Company, Philadelphia, Pa.
Tubes and flues	(2) Globe Steel Tubes Co., Milwaukee, Wis. (5) National Tube Co., Pittsburgh, Pa. (3) Steel and Tubes, Inc., Cleveland, Ohio
Syphons	Locomotive Firebox Co., Chicago
Smokebox hinges	The Okadee Company, Chicago
Staybolts—rigid	American Locomotive Co., New York
Flexible staybolts; expansion stays	Flannery Bolt Co., Bridgeville, Pa.
Flexible staybolt material	Ewald Iron Co., Louisville, Ky. Old Dominion Iron & Steel Works, Inc., Richmond, Va. Joseph T. Ryerson & Son, Inc., Chicago
Boiler and firebox rivets	The Champion Rivet Co., Cleveland, Ohio
Steam and exhaust-pipe welded fittings	Tube-Turns, Incorporated, Louisville, Ky.
Steam and exhaust pipe packing	The Garlock Packing Co., Palmyra, N. Y.
Throttle	American Throttle Co., New York
Piping	A. M. Byers Co., Pittsburgh, Pa.
Pipe covering	Union Asbestos & Rubber Co., Chicago
Superheater	The Superheater Company, New York
Stoker	Standard Stoker Co., Inc., New York
Grates	Waugh Equipment Co., New York
Fire door	Franklin Railway Supply Co., Inc., New York
Feedwater heater	Worthington Pump & Machinery Corp., Harrison, N. J.
Injectors	Nathan Manufacturing Co., New York
Blow-off cocks	T-Z Railway Equipment Co., Chicago
Blow-off muffler	Wilson Engineering Corp., Chicago
Washout plugs	American Locomotive Co., New York Huron Mfg. Co., Detroit, Mich.
Drain cocks; cylinder cocks	Barco Manufacturing Co., Chicago The Okadee Company, Chicago
Turret valves; injector check valves; boiler checks	Nathan Manufacturing Co., New York
Valves—blower, stoker engine and feed pump throttle	The Lunkenheimer Company, Cincinnati, Ohio
Valves—superheat lines	Walworth Company, New York
Valves—globe and angle	Crane Co., Chicago
Feed-pipe strainer	The Okadee Company, Chicago
Suction hose	Hewitt Rubber Corp., Buffalo, N. Y.
Sander equipment	Viloco Railway Equipment Co., Chicago
Whistle	Nathan Manufacturing Co., New York
Whistle-operating valve	Viloco Railway Equipment Co., Chicago
Low-water alarm	Nathan Manufacturing Co., New York
Cab-window sash	The O. M. Edwards Co., Inc., Syracuse, N. Y.
Cab windshields; clear-vision windows	The Prime Manufacturing Co., Milwaukee, Wis.
Cab seat cushions	United States Rubber Co., New York
Metal cab seats	Van Dorn Iron Works, Cleveland, Ohio
Running boards; cab deck	Alan Wood Steel Co., Conshohocken, Pa.
Flexible connections between engine and tender; air reservoir, air-compressor, power reverse gear, blow-off cock muffler, generator, aftercooler, and blower connections	Barco Manufacturing Co., Chicago
Headlight and headlight generator; classification and back-up lamps	The Pyle-National Company, Chicago
Tender:	
Frame	General Steel Castings Co., Eddystone, Pa.
Trucks, front:	
Six-wheel	(7) Buckeye Steel Castings Co., Columbus, Ohio (3) General Steel Castings Co., Eddystone, Pa.
Eight-wheel	(7) Buckeye Steel Castings Co., Columbus, Ohio (3) General Steel Castings Co., Eddystone, Pa.
Wheels	American Rolling Mill Co., Middletown, Ohio
Axles	Carnegie-Illinois Steel Corp., Pittsburgh, Pa.
Journal-box lids	National Malleable and Steel Castings Co., Cleveland, Ohio
Truck snubber springs	Cardwell Westinghouse Co., Chicago
Clasp brakes	American Steel Foundries, Chicago
Bearings	Magnus Metal Div., National Lead Co., New York
Bearings and wedges	Standard Forgings Corp., Chicago
Couplers	Buckeye Steel Castings Co., Columbus, Ohio
Tank plates	(6) Carnegie-Illinois Steel Corp., Pittsburgh, Pa. (4) Republic Steel Corp., Massillon, Ohio
Tank valves	Wm. Powell Co., Cincinnati, Ohio
Paint	E. I. du Pont de Nemours & Co., Wilmington, Del.



Sectional detail of expansion joint

Seal welding is used at the seams joining the wrapper side and roof sheets at firebox mud-ring corners and at the caulking edges of longitudinal barrel course seams. The firebox and combustion-chamber seams are all welded except the back head and inside door-sheet seams, which are riveted. The firedoor seam, the tube-sheet-ring seam and the smokebox joints are also welded.

The firebox has three syphons located in line transversely and connected from crown to throat. The superheater is the Type E with an American multiple throttle in the header. The feedwater heater is the Worthington Type 6½ S with the Type 6½ SA hot-water pump located under the air compressors. The cold-water pump is under the left side of the cab. The feedwater heater capacity is 14,400 gal. per hour. A Nathan Type 4000 automatic restarting injector has a capacity of 14,500 gal. per hour.

The fireboxes are fitted with Firebar grates having approximately 25 per cent air openings. The fuel is bituminous coal which is fed by a Standard Type MB stoker. The firedoor is a Franklin butterfly Type No. 8. The boilers are equipped with Nathan Type B low-water alarms and water circulators are applied to the first course, right side. T-Z blow-off cocks are located at the four firebox corners, the two forward blow-off cocks discharging through a Wilson centrifugal muffler on top of the boiler.

Steam Distribution System

Steam is taken from the superheater header through pipes inside the smokebox to outside pipes located on each side of the boiler. Through these outside pipes the rear cylinders are supplied. At the rear cylinders the steam supply is divided, half going to the cylinders and the remainder passing through a Y-pipe to the intermediate receiver pipe which is supported from the front engine bed. The receiver pipe passes through the front cylinders to another Y-pipe, by means of which delivery to the front engine cylinders is effected. Three expansion joints are used, one in each of the right and left outside steam pipes to the rear engine cylinders and one in the receiver pipe at the front engine cylinders. They are so designed that the surfaces bearing against the packing are separated by an open air space from the steam-containing walls of the joint. The receiver pipe is fitted with a ball joint at the rear engine cylinders.

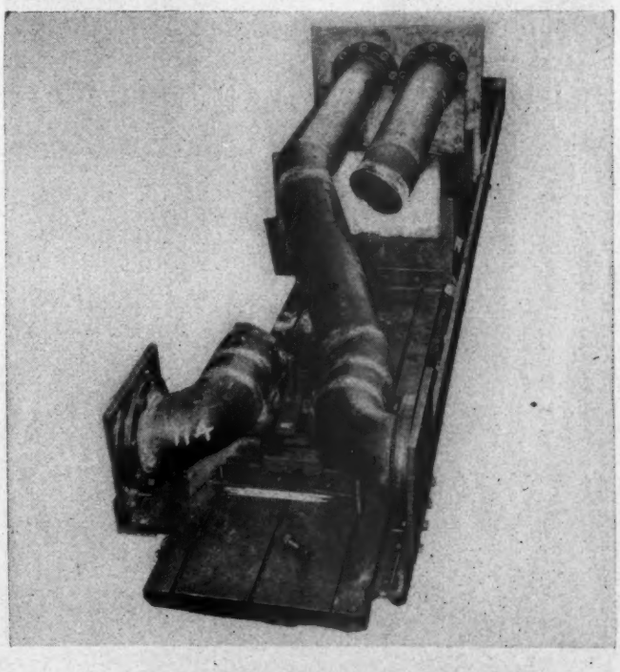
The exhaust-pipe arrangement is similar to that used by the C. & O. on its Class H-7a articulated locomotives. The cylinders of the rear engine exhaust through separate pipes on the right and left side to the rear exhaust stand where the steam from both cylinders passes through the same nozzle. The front engine cylinders exhaust into a Y-pipe and then through a single pipe to the front exhaust stand. The nozzles have 7-in. openings with ½-in. square cross-bridges. Separate exhaust pipes, with suitable ball and expansion joints, supply steam to the feedwater heater.

A detail of one of the expansion joints, showing the manner in which the packing is protected from steam temperature by an air space, is included in an accompanying drawing.

The steam and exhaust piping is fitted with Tube-Turn welded flanged fittings. In fabricating the piping templates were made as a result of which the entire piping system, with the flanged fittings, was assembled without need for alteration. High-tensile-steel bolts were used in the flanged fittings. Garlock packing was used in all the ball and expansion joints of the steam and exhaust system.

The Tenders

The tenders are the rectangular U type with a fuel capacity of 25 tons and 25,000 gal. of water. The tender frame, supplied by General Steel Castings Corporation, is a one-piece water bottom steel casting. The tender tank is of the riveted type. The tank plates are of



A set of pipes with welded fittings and Tube Turns on the jig ready for welding

carbon steel, the outside plates being 5/16 in., the top plates ⅜ in. and the slope plates ⅜ in.

The front tender trucks are the six-wheel type and the rear trucks are the eight-wheel type. Seven of the ten tenders are equipped with trucks furnished by the Buckeye Steel Castings Corporation and three are equipped with General Steel Castings Corporation trucks. The six-wheel trucks have 7-in. by 14-in. journals and the eight-wheel trucks have 6½-in. by 12-in. journals. All journals have plain bearings, with brasses furnished

(*Continued on page 216*)

New Haven

2,000-Hp. Locomotives

Twenty new Alco-G.E. Diesel-electric units have starting tractive force of 139,000 lb. and are designed for maximum speeds of 80 m.p.h.—Assigned to both freight and passenger service

In December, 1941, the New York, New Haven & Hartford received the first of 20 Diesel-electric locomotives of 2,000 hp. each designed for both passenger and freight service. The locomotives were designed and built by the American Locomotive Company in cooperation with the General Electric Company. They consist of 2,000-hp. units which are coupled for multiple-unit operation from the engineman's cab at the front of the leading unit. There are two 1,000-hp. Diesel engines in each unit, all four engines being controlled by the throttle. The new locomotives are geared to travel at a top speed of 80 m. p. h.

Each locomotive unit is carried on two six-wheel swivel-type equalized trucks. These trucks are of the General Steel Castings Corporation's design and are built with swing bolsters and one-piece frames, both of which are cast from alloy steel resulting in a light-weight truck. The trucks are identical in every respect and are equipped with 40-in. rolled steel wheels and Timken roller bearings.

The engine compartments are well arranged and roomy

The weight distribution between the three axles of each truck is quite uniform, even though the traction motors are mounted on the two outside axles and the middle axle is an idler. By this arrangement the center plate and swing bolster serve as an air passage to the motors so it is unnecessary to employ canvas or rubber boots, difficult of access, for carrying air to the motor.

The motor-truck center plate is provided with a wear-resisting steel liner and is oil lubricated, provision being made to regulate the level of the oil so that it will not flow over into the blower passages. The center plate is also fitted with a seal to prevent entrance of dust and dirt.

The trucks are fitted with clasp brakes and four operating cylinders, the braking ratio being 75 per cent with 50 lb. pressure in the cylinder. The brakes are operated by Westinghouse schedule 8-EL brake system. Automatic slack adjusters are used on all cylinders. The trucks are equipped with automatic sanders arranged to sand the front and back of the truck.

The truck frame is carried at four points by helical springs resting on the four equalizers. The truck bolster is likewise supported at four points by triple elliptic springs supported on spring planks which are attached to the truck frame by swing links. This creates a simple and rugged assembly which is unencumbered by intricate stabilizing devices.

With this design the tractive force and braking power pass through the center plates of the truck into the underframe. Consequently, each end of the underframe is equipped with suitable draft gear. Standard A. A. R. couplers, exposed type, are used at both ends of each unit.

Power Plant

The power plants have been designed as units, each independent of the other, and are located in the cab adjacent to their respective cooling radiators. Power is derived from the American Locomotive Company, six-cylinder, four-cycle Diesel engine with 12½-in. by 13-in. cylinders, equipped with a Buchi turbo-charger (exhaust-gas driven) and delivers 1,000-hp. at 740 r. p. m. for traction purposes. Additional features of this engine are its welded steel base and the built-in air compressor. This compressor is a Westinghouse 2-CD, two-stage compressor of 144 c. f. m. displacement at 740 r. p. m., thus the entire locomotive has a compressor capacity of 456 c. f. m.

The engine is fundamentally the same engine as furnished the New Haven in 1930 on its first Diesel switcher except that the first engine was not turbo-charged. By using turbo-charging, it is possible to build these high-speed Diesel passenger and freight locomotives in an

accessible, compact form and still retain the heavy-duty construction of the Alco engine.

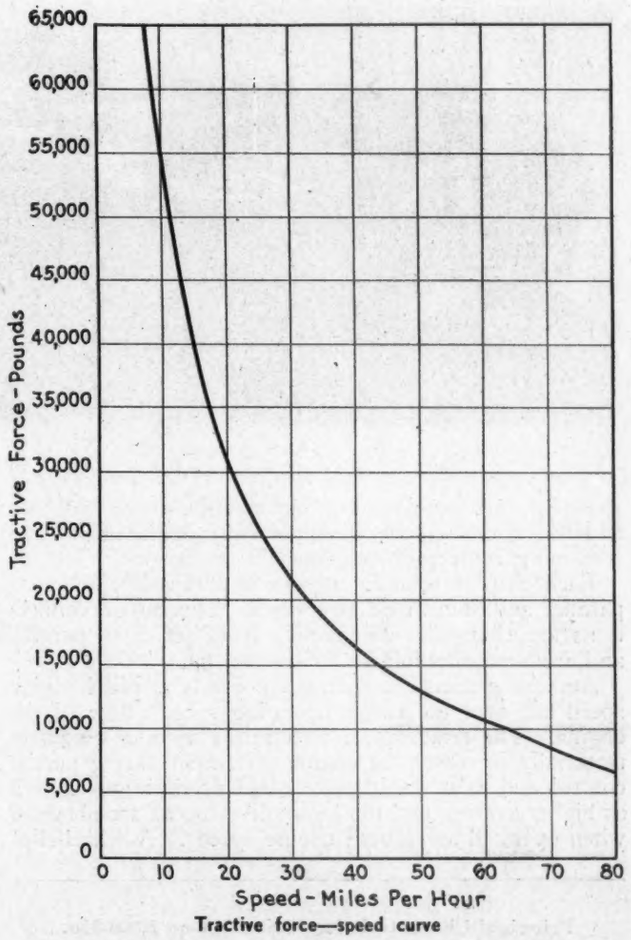
A Sturtevant blower is mounted adjacent to the engine and provides air for the traction motors. The blower is driven by V-belts from a pulley on the extension of the main engine shaft. The blower is mounted directly above the center-plate casting and delivers air through the center plate into the bolster.

Adjacent to each engine is a radiator compartment fitted with fin-tube radiators for cooling the water and lubricating oil. These radiators are set flush with the side of the cab and are fitted with shutters for regulating the flow of the air, and by-pass shutters to relieve the strain on the radiator shutters when completely closed. The radiator system is sufficiently large to meet the most severe operating requirements. Air is drawn through the radiators by a 54-in. G. E. Aphonic fan driven by V-belts from a pulley on the extension of the main engine shaft.

Electrical Equipment

The electrical equipment is built entirely by the General Electric Company. It includes two main traction generators per unit, together with a directly connected auxiliary generator, a belt-driven exciter, four GE-726 series traction motors and complete type P control equipment.

The main generator is supported by the engine frame and two spring-loaded feet attached to the generator frame. This construction insures alinement between the engine and the generator armature. A single self-alining roller bearing is used at the outboard end of the armature shaft. A split-pole exciter furnishes excitation to the main generator, an auxiliary generator supplies power for the control circuits, the electrically operated auxiliaries and for charging a 32-cell starting and lighting battery. Each main generator furnishes power for two direct-current commutating-pole traction motors. These motors are supported in the locomotive truck by sleeve-type axle bearings and spring nose suspension from the truck frame. The motor armature bearings are the roller type. The armature shaft is so installed that it can be removed without disturbing the windings or commutator. The motor frame is an integral steel casting and has large openings for inspecting brushes.



Tractive force—speed curve

The type P single-end, multiple-unit control functions with a minimum of attention on the part of the engine operator. The initial movement of the locomotive throttle closes contacts which operate the main circuit and field contactors. Additional movement of this throttle controls each engine governor, regulating the

One of the six-wheel motor trucks — The motors are geared to the outside axles

speed of the locomotive. The traction-motor reverser and line contactors are pneumatically operated and the remaining contactors magnetically operated.

Each pair of traction motors is arranged for series, parallel and shunt-field operation. The motor connections are changed automatically from series to parallel and from parallel-full-field to shunt field.

Automatic transfers are made not only at rated engine speed but over the entire operating speed range of the engine. The relay which effects this automatic control materially increases the engine utilization during partial control and as a result more rapid acceleration as well as higher average and top locomotive speeds are obtained when operated at reduced engine speeds. A wheel-slipping relay with a buzzer warns the operator when any pair of wheels slips.

Principal Characteristics of New Haven 2,000-Hp. Diesel-Electric Locomotives

Total continuous tractive force, lb.	50,400
Total starting tractive force, lb.	139,000
Maximum speed restriction, m.p.h.	80
Diameter of wheels, in.	40
Wheelbase, motor truck, ft.-in.	15-4
Center to center of trucks, ft.-in.	43-0
Wheelbase, on unit, ft.-in.	58-4
Wheelbase, two combined units, ft.-in.	130-8
Overall length (pilot to coupler) one unit, ft.-in.	74-3¼
Overall length, two combined units, ft.-in.	148-7½
Maximum curve, deg.	21
Width over panels, ft.-in.	9-10½
Width, maximum (over handles, etc.), ft.-in.	10-6
Height, top of rail to cab roof, ft.-in.	13-6
Height, top of rail to top of ventilators, ft.-in.	14-4
Fuel tank capacity (two tanks), gal.	2,400
Total sand capacity, cu. ft.	32
Water tank capacity (two tanks), gal.	2,050
Weight on driving axles (one unit), lb.	231,000
Weights on idler axles (one unit), lb.	115,500
Total (one unit), lb.	346,500
Total (two units), lb.	693,000

A multi-button switch at the operating stations gives the engineman control of the fuel pump, engine starting and the several lighting circuits.

Cab and Superstructure

The cab is a truss structure in which the underframe is stiffened by two deep side trusses, one on each side of the cab. These side trusses support the roof, as well as provide a mounting structure for the side panels. The roof is equipped with hatches through which the power plant and steam generator can be removed. The side panels carry no load beyond their own weight. They are of Plymetl. Each panel is hermetically sealed by folding over at the ends of the panel and soldering the stainless outside face to the Galvannealed interior surface. Strips hold the panels in place by clamping a soft-rubber channel on their edges. Shatter-proof glass windows, several of which are hinged for ventilating purposes, are set in stainless-steel frames in the side panel.

The streamline end of each unit is made of $\frac{3}{16}$-in. steel plate, heavily braced. Within the nose thus formed are located the air-brake and train-control equipment. The headlight is built into the nose so that its lens is sealed in and the interior of the headlight is accessible through a drop door from within the nose.

The operator's compartment is located just back of the nose and is raised above the level of the engineroom floor. Both the operator and his assistant have deeply upholstered adjustable seats located on the platforms. From these they have an unobstructed view out over the cab nose. The divided front windows are of shatter-proof glass $\frac{5}{8}$ in. thick. These windows are sloping and are provided with a defrosting arrangement, windshield wipers and sun visors.

The operator's compartment is separated from the engineroom by an insulated partition. The ceiling has been given a sound-absorbing surface and insulation. The floor is covered with battleship linoleum cemented to a heavy plywood base. This compartment is equipped with drop windows and no-draft ventilation, also with doors leading to the compartment end or nose and to the engineroom compartment, and one outside door on each side. Fin tube radiators provide steam heat for the compartment.

The control and other operating equipment in this compartment is greatly simplified. The usual brake valves, and sander, bell, horn and headlight controls are present, along with a small electrical controller. This controller has but two levers; one is the reverse lever and the other controls the throttle operating mechanism for all four Diesel engines. By making the electrical equipment fully automatic, much complication was avoided in both the equipment and in the operation of the locomotive. The operator merely moves the controller handle to the notch in which he wishes to operate and the automatic control determines the motor connections. A signal lamp indicates wheel slipping.

In the cab are also signal lights for overheated engines, low lubricating-oil pressure and steam-heat generator trouble. Both units register on these lights, for, like the control, the signal wires are carried in the train-line jumpers. The operator has a speed indicator before him while his assistant has gages showing the fuel and water supply on hand.

In addition to the main control, levers and switches in the operator's cab, each Diesel engine has its own start-and-stop switch, located on the wall convenient to the

engine, which permits each engine to be started or stopped independently of the other.

Auxiliary Equipment

In each unit, there is a Clarkson steam generator rated at 2,250 lb. of steam per hour. This is a flash-type steam generator and is automatic. Also in each unit is an electrical control compartment. Here all the contactors, reversers and relays are located. The cabinets are divided so that the power circuits of each power plant are separate in all respects. All wiring is enclosed in metal conduit and the leads from the battery box come directly into the cabinet.

Each unit is equipped with a 32-cell Exide battery located beneath the underframe in a compartment built into the water tank so that it is easily accessible and well protected. Also beneath the cab and between the trucks are the fuel-oil tanks and the air reservoirs. The air reservoirs have a total capacity of 62,000 cu. in. per unit, or 124,000 cu. in. for both units.

The locomotive is finished in accordance with the New Haven's regular practice for streamline locomotives; the exterior of the cab is painted Pullman green with gold stripes, figures and letters. The New York, New Haven & Hartford monogram appears in black letters on the front of each streamline nose. The parts below the cab are painted black.

Operating Assignment

Enginemen of regular passenger and manifest freight trains, to which the new locomotives were assigned for their initial revenue hauls, were instructed by the road foreman of engines until qualified in their operation. As the locomotives were recently assigned, before the eighth unit was delivered, they comprised a pool of seven interchangeable 2,000-hp. units, all in through passenger and freight service between Boston, Mass., and New Haven, Conn., as single or double units, according to the size of the train.

For easy identification, we may take the seven individual locomotive units A, B, C, D, E, F and G, and follow A through the cycle.

At 8 a. m. unit A leaves South Station, Boston, on passenger train No. 7, The Murray Hill, arriving at New Haven, a distance of 157 miles, at 11:15 a. m. with stops at Providence, R. I., Westerly, Conn., New London and Saybrook. At 12:40 p. m., one hour and twenty-five minutes after the scheduled arrival at New Haven, unit A returns eastward with passenger train No. 188, the Pilgrim, arriving at Boston at 3:55 p. m., after five intermediate stops. Unit A then runs to the outbound Boston freight yard and couples on to a symbol freight train, designated NE-1, departing at 5:15 p. m., one hour and twenty minutes after arrival in passenger service, due at New Haven, Water street yard, at 10:00 p. m. One hour later, at 11:00 p. m., unit A is scheduled to leave New Haven, Water street yard, with symbol freight train HB-2, due at Boston at 3:50 a. m. On Sunday this unit covers train No. 27, the Merchants Limited, leaving Boston at 5:00 p. m., due at New Haven at 7:51 p. m., this in lieu of symbol freight train NE-1 which does not operate on Sunday.

In a similar fashion units B and C operate through Boston-New Haven service on the following trains in sequence as listed: Passenger train No. 175, The Colonial, leaving Boston at 9:00 a. m. and arriving at New Haven at 12:26 p. m., with five intermediate stops, returning on passenger train No. 14, the Bostonian, leaving New Haven at 1:30 p. m., one hour and four minutes after arrival at New Haven with train No. 175, and arrives at Boston at 4:45 p. m., with five intermediate stops. This double unit then runs to the outbound Boston freight yard and couples to a symbol freight train, designated BG-3, leaving Boston at 6:15 p. m. and arriving at Cedar Hill at 11:35 p. m. It returns on symbol freight train NE-2 leaving New Haven at 12:45 a. m., due to arrive at Boston at 6:10 a. m. where this unit lays over for servicing and again starts out on symbol freight train BH-1, The Cannonball, leaving Boston freight yard at 5:45 p. m., due at New Haven at 10:50 p. m. It leaves New Haven again on symbol freight train HB-4, leaving Cedar Hill yard at 11:30 p. m., due at Boston at 7:15 a. m. where it turns to passenger train No. 11, The Park Avenue, leaving Boston at 10:00 a. m. and arriving at New Haven at 1:10 p. m. It then returns on passenger train No. 22, The Yankee Clipper, leaving New Haven at 2:25 p. m. and arriving at Boston at 5:30 p. m. It then runs to the outbound Boston freight yard and starts out in freight

(*Continued on page 216*)

The principal controls at the operator's station

Chesapeake & Ohio Coaches

Seats for 80 are provided in two compartments — The cars were built by the American Car and Foundry Company of carbon steel, largely by riveting— The structures include unusual protection against telescoping under collision impacts — Weight, 139,660 lb.

THE Chesapeake & Ohio is receiving delivery from the American Car and Foundry Company of twenty double vestibule coaches which are notable for their simplicity of interior design. Each car accommodates 80 passengers in double rotating, reclining seats.

The cars are of modern design, to the present A. A. R. standard contour for new passenger cars, but without skirts. They have a coupled length of 80 ft. 5¾ in.; length center to center of trucks, 55 ft. 11 in.; height rail to top of roof, 13 ft. 6 in., and width over side sills, 10 ft. The light weight of the car body is 91.840 lb.: the two six-wheel trucks, 47,820 lb.—a total of 139,660 lb. Toilet facilities for men and women are located at each end of the car, and the cars are partitioned to form a smoking room, or Jim Crow section, at one end, with a seating capacity of 20 passengers, while the main passenger compartment seats 60.

The Car Structure

The car structure is designed to meet the requirements of the U. S. Post Office Department's construction specification and the A. A. R. specification for the construction of new passenger equipment cars dated March 24, 1939. The first car shell was subjected to the A. A. R. squeeze test at Altoona, Pa., with very good results.

The car frame is of riveted and welded girder design and is built of ordinary openhearth carbon steel. The center sill comprises two A. A. R. Z-26 sections weighing 36.2 lb. per foot. They are spaced 16 in. between webs, with a ⅜-in. bar welded continuously to the upper inner flanges, and angle reinforcements at the bottom. The draft sills are a continuation of the center sills and are attached to the steel buffer castings. The side sills are 5-in. by 3-in. by 5/16-in. angles, and the side plates are 3-in., 6.7-lb. Z-bars. The sheathing is of No. 11 gauge steel and the roof sheets No 14 gauge steel. The side posts are pressed channel shape and the carlines are pressed Z shape. Unusual protection against telescoping in the event of collision is obtained by the extension of the vestibule I-beam end posts downward through the steel buffer casting to a distance of 22 in. above the rail. Another exceptional measure for the protection of the car against the effects of heavy end blows is the horizontal girder which extends across the car at sideplate height from the vestibule end posts to a line 8 ft. 3 in. inside the body of the car.

The underframe is covered with No. 18 gauge galvanized sheets. The car floor is laid on seven longitudinal wood stringers. It consists of ⅝-in. Keystone galvanized steel, covered with Tuco Flexolith. Insulation is 2 in. thick in the sides, ends, roof, and floor of the car. Ten cars have Stonefelt insulation, Type M., and ten cars Fiberglas insulation.

Miner A-5-XB friction draft gears and B-10-X buffing

C. & O. Coach built by the American Car and Foundry Company

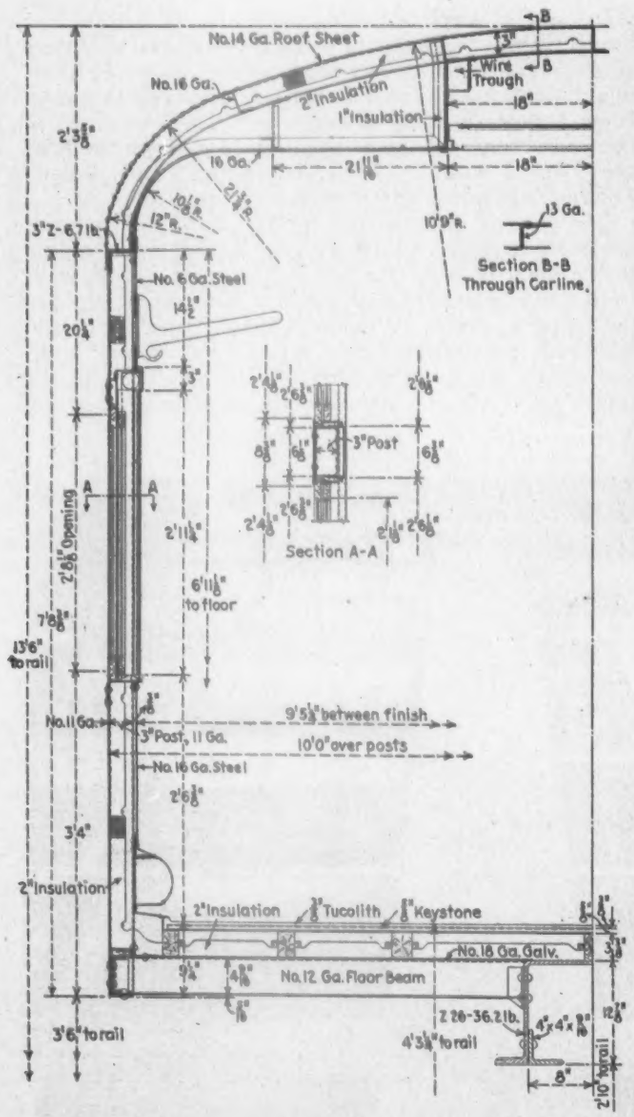
devices are applied, with Buckeye Type E couplers and A. S. F. cast-steel yokes. The coupler carrier and centering device was designed by the car builder and is supported by the main vestibule post extensions. It provides for limited lateral movement of train-line pipes. The face plate and buffer angle are supported by anti-rattling rods with the Fowler upper buffing device. Tuco National type trap doors are used over steel steps with Kass treads. Adams & Westlake vestibule curtains and two-fold U-shaped sectional diaphragms are at each end.

Interior Treatment

Simplicity of design and decorative treatment characterizes the steel interior finish. The bulkhead and swing door in the main passenger compartment are glazed in the upper panels. All exterior and interior doors are of steel. Window sash throughout the car are of mahogany, double, except at the toilets which are single. The outside sash are stationary and are thoroughly sealed. The inside sash are arranged to swing, being hinged vertically at one edge. The lower part of the toilet-room walls to a height of 28 in. from the floor are covered with Tylac $\frac{3}{16}$-in. imitation tile, $4\frac{1}{4}$-in. squares, in white with forest green scored lines.

The interior paint colors for the main compartment are various shades of Dulux gray. The entire ceiling in the main body of the car is light gray. Side walls from the side-plate moulding to the window capping are medium gray green. Window capping, basket racks, and bulkheads are medium gray green. Passageway walls and ceiling are also gray green. The side walls of the toilets above the tile wainscot are medium gray green.

Right: A general view of the underframe — Below: One end of the underframe showing the buffer casting and the end-sill and bolster construction



Sections through the car body and underframe

Vestibule walls and ceilings are painted dark green the same as the exterior of the car. All trimmings within the car are statuary-bronze finish.

The tubular-frame seats are double rotating with reclining backs. The cushions are foam-rubber and the upholstery Massachusetts mohair plush. Ten car sets, furnished by the Heywood-Wakefield Company, are upholstered in two-tone brown, and ten car sets, furnished

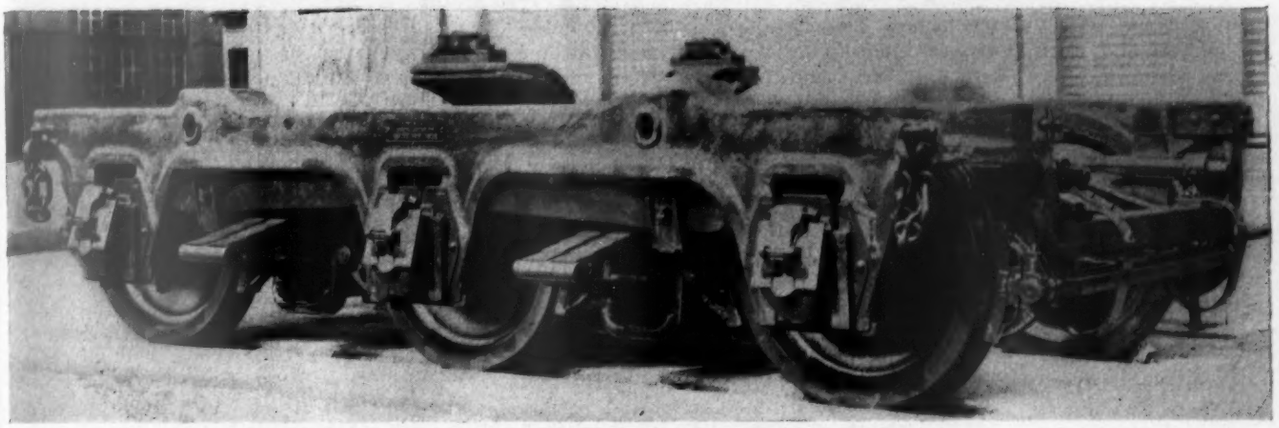
The horizontal anti-collision girder extends inside the car one window beyond the toilets

by the Coach & Car Equipment Company, are upholstered in two-tone rust.

The main floor has an aisle strip 18 in. wide, of ¼-in. Goodyear green mottle rubber, adged on each side with a 2-in. mottled cream strip. Toilet floors are covered with mottled cream rubber and the vestibule platforms with mottled green rubber.

Window curtains are silk-faced Pantasote material. The gray background is relieved with a small design in gold. The Adams & Westlake basket racks are 18 in. wide, of the continuous sectional type. Dayton monel-metal washstands and Duner single-pan flushing hoppers are used. The usual toilet-room accessories, such as clean- and used-towel cabinets, comb-and-brush

In the main passenger compartment, looking toward the smoking-room partition



Straight-equalizer truck with inside side bearings for the C. & O. coaches

racks, coat hooks, and toilet-paper holders are provided. A mirror 18 in. by 30 in., is mounted in a frame over the washstand in each toilet room.

Lighting Equipment

The lighting equipment consists of a Safety body-suspended 4-kw. generator with Dayton V-belt drive. Storage batteries are supplied in equal numbers by four companies—the Electric Storage Battery Company, the K. W. Battery Company, the Gould Storage Battery Corporation, and the Philco Corporation, Storage Battery Division. There are nine Safety center lighting fixtures in the passenger compartments. These are square with opalescent glass reflectors and are recessed into the Multi-Vent center ceiling panels. A passageway ceiling fixture is located at each end of the car to match the center fixtures. Bracket lamps are placed above each washstand and vestibule ceiling fixtures are located over each step entrance.

A Multi-vent ceiling panel (left) and air-control panel (right) dropped, showing the interior of the air duct

The lower ends of the vestibule end posts extend well below the buffer casting

Air Conditioning

The air-conditioning equipment consists of the Waukesha seven-ton ice engine, with the necessary fuel tanks located beneath the car floor, and the standard overhead evaporator unit of the car builder, arranged for both cooling and heating, located over the toilets at one end of the car. Conditioned air is delivered to outlets in the Multi-Vent ceiling panels. Vapor control equipment is installed for cooling and heating. The floor heat is Vapor steam heat, including copper unit-fin-type radiation with thermostatic control. Vapor steam-heat couplers and flexible metallic conduit are used with 2-in. Gold valves. The steam train line is 2 in. extra-heavy wrought iron and Wovenstone insulation is applied over all steam pipes and fittings underneath the car. Four Garland exhaust-type roof ventilators with Auer registers are installed in each smoking compartment. There is also one over each toilet

room and one at the switch locker. Heater-pipe guards are curved and continuous, terminating approximately 1½ in. above the floor, with perforations in the vertical face only. They are applied high enough to facilitate cleaning underneath.

Air brakes are New York schedule UC-1-18 type. Blackall drop-handle hand brakes are applied in each vestibule with Peacock hand-brake boosters. The trucks are the General Steel Castings six-wheel straight-equalizer type, having inside side bearings. The wheel base is 11 ft. The axles have 5-in. by 9-in. journals, which are fitted with standard A. A. R. journal bearings. Journal boxes are the National Malleable & Steel Castings Company's cast-steel pedestal type with malleable-iron lids. The Armco multi-wear wrought-steel wheels are 36 in. in diameter. The treads were ground after the wheels were mounted on the axles. The truck center pins are of the Miner locking type and Stucki roller side bearings are used. The truck clasp brakes are the A. S. F. Simplex type.

New Haven 2000-Hp. Locomotives

(*Continued from page 211*)

service on symbol freight train BO-1, leaving Boston at 6:45 p. m. and arriving at Cedar Hill at 12:20 a. m., turning at New Haven to passenger train No. 4, the Narragansett, leaving New Haven at 3:00 a. m., due at Boston at 6:50 a. m. This unit then turns to the original cycle on train No. 175.

Likewise units D and E, and F and G, follow the same cycle. This is the normal assignment of the pool as a whole. By rotation one set of two units will be serviced at Boston each day.

While the schedules of the trains handled by the new locomotives were not revised with the introduction of the latter, performance of the schedules has been greatly improved. Officers of the road point out that regardless of the extremely short turn-around time allowed for the units, *no relief power is provided at terminals.*

Hence, all operating personnel know that schedules must be maintained or else a later train in the other direction is likely to lack a locomotive. There is no excuse for delaying a new Diesel. Dispatchers and yardmasters are expected to perform, and mechanical forces, as well, are faced with short servicing periods and can't "pray over" the new units all day. As far as the new locomotives themselves are concerned, turn-around time could be shortened even further if it were not necessary to run around the test train-control loops at each terminal.

The passenger trains which the Diesels haul are all heavy through runs between Boston and New York or Washington, D. C., and comprise as high as sixteen Pullman, coach and head-end cars. Steam locomotives on the New Haven-Boston run take water from a spout at the Providence station on a sharp curve which necessitates enginemen pulling in very slowly and "inching her to the faucet." The new locomotives permit a quick, smooth stop and show greatly increased acceleration out of the station.

In freight service the new locomotives are hauling the "hot-shots" of the railroad, all of which are timed for close connections with other railroads. While operating schedules have not been modified, the Diesels eliminate a regular coal and water stop at Midway (near New London) and have substantially reduced actual running time. This improvement is due in part to the ability of the Diesel-electric to accelerate faster than steam locomotives at slow and moderate speeds. The New Haven's "Shore Line" is characterized by numerous long curves and draw bridges which require constant speed reductions. The Diesel-electrics' quick "pick-up" helps to overcome this operating handicap.

C. & O. 2-6-6-6 Locomotives

(*Continued from page 206*)

by Magnus. The trucks are equipped with A. S. F. clasp brakes with a braking ratio of 70 per cent of the light weight at 50 lb. brake cylinder pressure. The brake rigging is designed for 100 lb. cylinder pressure.

The tank plates were supplied by Carnegie-Illinois and Republic Steel; the truck axles by Carnegie-Illinois and the tender-truck wheel by Armco. The tender draft gear is Miner A-22-XB with Buckeye Type E couplers and yokes. Cardwell-Westinghouse snubber springs are used on all trucks.

A 76-YEAR OLD LOCOMOTIVE is still in service on the British London Midland & Scottish. Old No. 20002 is probably the oldest tender locomotive (there are older engines of the tank type) in service in Great Britain. The locomotive has two fellows of the same class, but one year her junior, which are also still in service.

* * *

Missouri Pacific depressed-center flat car by the American Car and Foundry Company

This car, built in 1941, has a one-piece cast-steel underframe and six-wheel equalized trucks with 6½-in. by 12-in. journals and 30-in. rolled-steel multiple-wear wheels. Truck centers are at 44 ft. and the length over the coupler pulling faces is 61 ft. 4 in. Width: Maximum, 8 ft. 10¾ in.; at well, 7 ft. 8 in.

EDITORIALS

Billion Dollars A Month

Secretary of the Treasury Morgenthau has pointed out that the sales of Defense Bonds during the period May, 1941, through March, 1942, amounted to $4,860,000,000, or an average of approximately $440,000,000 a month. A goal of twelve billion dollars has been set for the sale of United States Savings Bonds, Series E, F and G, for the twelve-months' period beginning July 1. This will be slightly more than 10 per cent of our estimated national income during this period. It requires, also, that the American public shall buy bonds at a rate two and a half times the accomplishment of the past year. The Treasury Department has found that the "most effective single method for promoting the systematic purchase of the United States Savings Bonds is through the payroll savings plan." Almost fifty thousand firms, employing a total of roughly twenty million people, have made such plans available to their employees. The problem now, in the interest of winning the war and doing what we can to check inflation, is to speed up the campaign, with the objective of securing an average purchase of bonds equal to 10 per cent of the gross payroll. As Mr. Morgenthau frankly states, "the ever-increasing demands of our war machine create an urgency that we cannot escape or evade."

A Grave Risk Too Blithely Assumed

The prospects for adequate transportation to insure the full attainment of the nation's war objectives received a most discouraging set-back early in April. On April 4 the War Production Board took control of the production and delivery of cars and locomotives. Deliveries on orders then in process or to be built later are to be made only as directed, and they may be allocated to roads other than those who placed the orders. Then, on April 8, announcement was made that materials would be allocated during the remainder of 1942 for the production of only 18,000 freight cars and 300 locomotives in addition to the cars and locomotives for which provision was made by the former Supply Priorities and Allocations Board on January 2 in schedules running until May 1. The railroads will thus be limited to approximately 63,000 new freight cars and 1,226 new locomotives during 1942. The number of locomotives does not fall far below the general expectations, but the curtailment in the number of new freight cars in prospect is decidedly disturbing.

Several estimates have been made as to the number of new freight cars required to meet the needs of the railroads for the increasing volume of freight transportation which they must produce. In a study of the freight-car situation published in the Annual Statistical Number of the Railway Age at the beginning of the year, an increase in ownership between October 1, 1941, and October 1, 1942, of at least 90,000 cars—preferably of 140,000 cars—was suggested. In the railroads' estimate of steel requirements for 1942, which were compiled at the request of WPB during January, provision was made for 121,827 freight cars. Including the carryover of orders undelivered on January 1, orders were on hand at the end of March calling for the building of about 94,500 freight cars.

No one has ever accused the railroads of being over liberal in the estimates of their needs for new equipment, and the orders awaiting delivery on March 31 may be considered a measure of the conservative judgment of the railroads relative to their needs at that time. The War Production Board's plan represents a deficiency below this number of 31,500 cars.

Until 1939 and again last year the performance during the four highest weeks of the fall peak in 1929 represented the most intensive utilization of freight cars of which clear records are available. In 1939, there were 1.62 active cars per weekly car load; in 1929, 1.67. The number of cars on line per weekly car load in 1939 was considerably higher than in 1929. Last year, these conditions were just reversed. There were 1.81 cars on line per weekly car load as compared with 1.88 in 1929, but the 1.69 active cars per weekly car load were slightly higher than the 1929 figure. The point at issue is whether the utilization represented by the lowest of these ratios will be greatly exceeded.

There are several factors which must be considered in any attempt to answer this question: first there is the resiliency of the railways to meet difficult situations, a quite indeterminate factor; second is the cooperation between shippers and the railroads to cut down idle car days and to increase the average car load and General Order No. 1 of the ODT to increase the tons per car of l. c. l. freight. These factors are both favorable to record-breaking car utilization.

The increase in average haul, however, is an unfavorable factor. During the third quarter of 1941 each car load averaged 29.7 tons—2.3 tons more than during the third quarter of 1929—and each revenue car load moved on the average about 390 miles, almost 28 per cent farther than during the same quarter of 1929. During January and February, 1942, each revenue car load carried an average of 29 tons, which compares with

27.6 tons during the first quarter of last year, and moved its load an estimated distance something over 60 miles farther than the approximate 390 miles averaged by cars loaded with revenue freight during the first quarter of last year. While the increased load conserves car capacity, the increased length of haul represents an appreciable addition to the time en route.

In using the carloading ratios of the four weeks with the highest loading in the fall as the basis for estimating car needs, consideration must be given as to the probable duration of peak traffic conditions. For many years a period of four weeks has adequately covered the peak condition, with carloading values definitely ascending and descending before and after this period. But last year the variation in the number of weekly carloadings was very small for eight weeks. And this fall carloadings may continue at peak levels even longer. This is a factor decidedly unfavorable to effecting a decrease in the ratio of cars on line to average weekly carloadings, because it is sure to cause some temporary increase in the number of bad-order cars. An accumulated reserve of physical car conditions which will go through a period of four weeks' intensive use without apparent strain will become threadbare in spots before the end of a similar two or three months' period.

The need for steel to build ships and other war equipment is very great. Indeed, if we had capacity to produce enough of it, our war production objectives might very well be set much higher than they now stand—the war might thereby be shortened. But in taking steel from the railroads in order that production of these essential war materials may be pushed up to otherwise impossible levels, a grave risk is being assumed that either the war program may be slowed down directly by lack of transportation, or that our civilian needs will be curtailed below the minimums now rapidly being established by rationing. And that, too, will result in a slowing down of our war-production program.

"Mines Above The Ground"

The importance of finding every bit of idle usable material and getting it back into useful service as an aid to the prosecution of the war is emphasized by the series of meetings which are being organized under the sponsorship of the Bureau of Industrial Conservation of the War Production Board. Such a meeting for the consideration of engineering aspects of the national industrial scrap salvage program was held in New York on April 28. Cooperating in organizing the meeting were the 24 engineering, technical, and industrial societies and associations with organized groups within that city.

The program dealt with the needs for and methods of reclaiming many types of materials.

In the matter of steel, particular stress was placed on the need for saving and reclaiming all alloy scrap. It was pointed out by Dr. Charles Herty of the Bethlehem Steel Company that the quantity of alloy steel that can be produced from a given amount of nickel can be increased about 40 per cent by adding the steel plant scrap to the new nickel, about 78 per cent by the further addition of normal commercial alloy scrap, and by about 150 per cent if the nickel alloy turnings can be reclaimed and put back to use.

These figures clearly indicate the tremendous importance of restoring alloy-steel scrap to useful service. To accomplish this, however, such scrap must be segregated, not only from carbon steel but into several classifications, depending upon the nature of the alloy. The urgent need for more of almost every element used in producing alloy steels than can possibly be furnished in the form of raw material calls for unusual care in preventing the loss of any of these valuable elements by segregating them at the source. The same thing applies in the case of non-ferrous metal scrap, but this probably needs but little emphasis on the railroads.

Speeding the Movement Of War Materials

Three circular letters recently issued by the Association of American Railroads, Mechanical Division, over the signature of Secretary A. C. Browning, deserve special emphasis because of their important bearing on the speedy movement of war materials and civilian goods as well.

The first of these letters was necessitated by the fact that important government materials continue to be loaded in cars which require shopping enroute on account of defective conditions, such as air brakes overdue for periodic cleaning, brake pipes broken on account of insufficient anchorage, excessive brake-pipe leakage, piston travel not in accordance with the standard requirements, journal boxes overdue for periodic packing, etc. The present is obviously no time to let up on the drive for proper inspection and conditioning of cars before loading so as to avoid the necessity of shopping such cars enroute and thus delaying the movement of materials. This applies in the case of government consignments and the delays are almost equally objectionable in the case of civilian goods.

Another vital requirement, second only to the provision of serviceable equipment for loading, is the safe and satisfactory securement of these loads, especially on open-top cars, so that they will safely move to destination in modern high-speed freight trains, which are not only handled over the road at high operating speeds but are subject to fast switching at yards and terminals. This subject, discussed in the second circular letter, needs further concentrated attention by railroads, some of which are not giving proper supervision to the loading and securing of loads on open-top cars. The refusal

to accept in interchange shipments not loaded strictly in accordance with the published loading rules of the A. A. R. Mechanical Division, would undoubtedly overcome this difficulty. A more satisfactory method is to police the situation at originating points, convince shippers of the need for strict adherence to the A. A. R. loading rules, and thus avoid any commodities being loaded in such a way that they cannot proceed safely to destination without adjustment and delay enroute.

In the third letter, attention is called to numerous reported cases of the loading of unfit cars at manufacturers' plants having government contracts where qualified railroad inspectors do not have a chance to check empty cars before being reloaded. As a result, cars loaded with war materials have had to be set out enroute for necessary repairs and the adjustment of loads, thus causing delay to vital commodities.

Apparently a considerable amount of military equipment is still being loaded at army camps, as well as industrial plants, where railroad inspectors are denied admittance. Advice from Washington regarding this matter is to the effect that until definite action has been taken by the War department, carrier employees, in order to enter a military post or station, must comply with the rules and regulations established by the commanding officers for such admission. This is also the case in connection with entering plants manufacturing military equipment where rules and regulations have been established by army authorities.

A number of carriers have already taken steps to correct this situation by providing identification cards for employees whose duties require entrance into military reservations, this card bearing the signature of the employee, his photograph and the card being countersigned by an authorized company officer. Obviously, this practice must be more widely and generally adopted if freight cars are to be properly inspected at military reservations and industrial plants having government contracts, and thus prevent the loading of bad-order cars at these points and also make sure that all loads are properly secured in accordance with the A. A. R. loading rules.

New Books

PRACTICAL ARC WELDING. *A text book by W. J. Chaffee. Published by Hobart Trade School, Inc., Troy, Ohio. 516 pages, illustrated. Bound in red fabrikoid. Price, $2.*

To assist in developing the trained welding personnel demanded by the sudden acceleration of welding activity due to the national defense program, this handbook of practical arc welding has been written to replace the former Hobart book on welding. Part I is devoted to general welding information—the growth of arc welding; where arc welding is used; manufacturing applications; available metals and alloys; discussion of joints and welds; electrodes and filler rods; strength of arc-welded joints; cost of arc welding; characteristics of the welding arc; welding symbols and their use; equipment for arc welding; development of welding personnel. Parts II and III are devoted to the series of arc-welding lessons offered in the Hobart Trade School. This group of lessons covers preliminary instructions; starting and manipulating the arc; common joints with bare electrodes; welding light gauge sheets with coated electrodes; welding with coated rods in all positions; pipe welding; welding cast iron; special tests; welding with the carbon arc; "long arc" method of welding copper, and specialized applications of arc welding. Parts IV and V contain a dictionary of welding terms and helpful tabular data for operators and designers.

CONTRIBUTIONS TO THE METALLURGY OF STEEL. *Booklets Nos. 1 to 5, inclusive. American Iron and Steel Institute, 350 Fifth avenue, New York. Nos. 1 to 4, 25 cents each; No. 5, 50 cents.*

The five booklets which constitute the series of Contributions to the Metallurgy of Steel are, respectively, on Possible Substitutes for Nickel Steels; Direct Consumption of Aluminum in the Steel Industry; Problems Involved in the Conservation of Manganese; Possible Substitutes for Zinc Coatings on Steel, and Possible Alternates for Nickel, Chromium and Chromium-Nickel Constructional Alloy Steels. The report contained in Booklet No. 1 on Possible Substitutes for Nickel Steels, issued in May, 1941, deals only with constructional steels containing not more than the following percentages of the given elements: chromium, 1.50; nickel, 5.25; molybdenum, 0.75; manganese, 2; silicon, 2, and vanadium, 0.20. Part II deals with Carburizing Steels and Part III with Thorough-Hardening Steels. Booklet No. 5—Possible Alternates for Nickel, Chromium and Chromium-Nickel Constructional Alloy Steels—was recently prepared at the request of O.P.M. It gives details of four completely new series of alloy steels designed by a group of metallurgists from technical committees of the Institute, the S.A.E., and from alloy manufacturing companies. They embrace a series of carbon-molybdenum steels, manganese-molybdenum steels, low chromium-molybdenum and low nickel-chromium-molybdenum steels. These possible alternates are confined to constructional alloy steels containing not more than the following percentages of the following elements: nickel, 5.25; chromium, 3.99; manganese, 2; silicon, 2.25; vanadium, 0.25, and molybdenum, 1. They do not embrace the following types of steel: low-alloy high-tensile steels which are furnished as flat rolled products and which require no heat treatment; stainless steels or irons such as the high chromium or chromium-nickel types; medium chromium (2 to 10 per cent chromium) steels which sometimes contain other elements and which are used to resist scaling at elevated temperatures; or any class of tool steel.

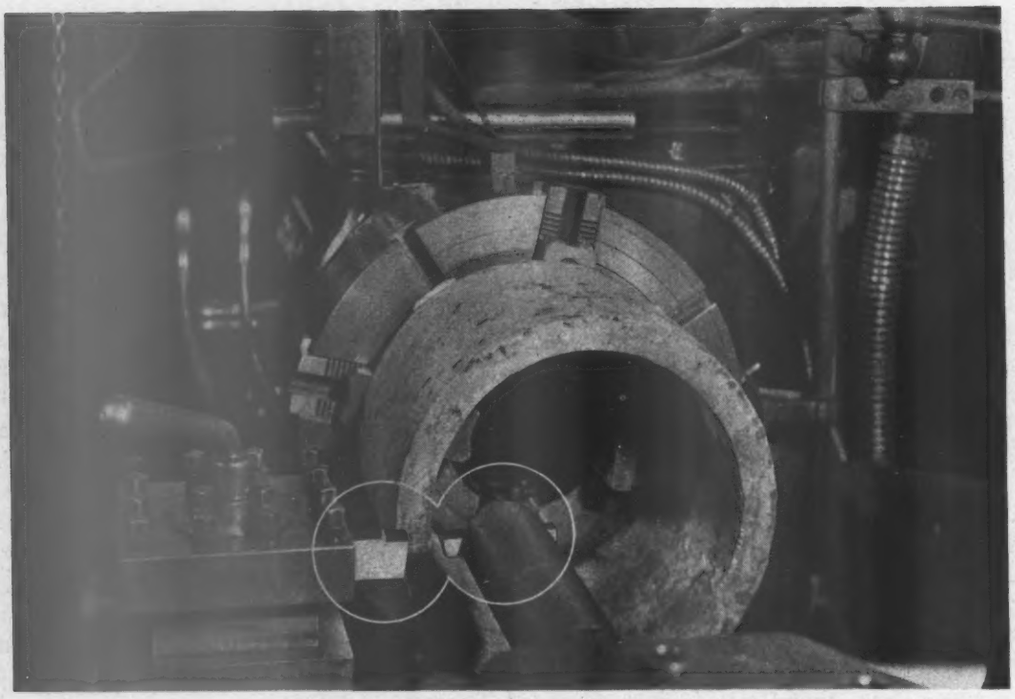


Fig. 1—Set-up of Firthite boring and turning tools in a horizontal turret lathe for machining rod brasses at 400 ft. per min.—As many as 500 bushings are finished between tool grinds

Sintered Carbide Tools on Railroad Machining Jobs

*By E. T. Broaddus**

In railroad shops, sintered carbide tools have usually been introduced first on brass and bronze work such as bushings, hub plates, and other wear parts. Such installations feature longer tool life, better finish, and closer tolerances. Many brass and bronze parts having rough, "sandy" surfaces and of abrasive composition can be machined without difficulty and without the usual rapid wear on tools formerly used.

Carbide tools can be used profitably on the older machines doing this class of work and present no problems where the higher speeds are not available. Fig. 1 shows a rod brass being machined at 350-400 ft. per min. with feeds (according to machine capacity) usually about ¼ in. to 1/16 in. The tools run from a week to 30 days on each grinding, producing from 250 to 500 bushings before requiring resharpening.

Heavier brass and bronze machine work calls for heavier tools of sufficient hardness to withstand wear and at the same time toughness to withstand intermittent cuts. Two installations of this kind are illustrated in Figs. 2 and 3 which show the operations of machining bronze hub plates and crown or driving box brasses, respectively. An ingenious jig for holding the hub plate; shown in Fig. 2, greatly increases the machine production on this particular job. On the intermittent cut, shown in Fig. 3, the carbide tools maintain accurate bore and finish on this material which is usually tough or abrasive. Long tool life between grinds (60 to 75) is also secured.

Many special jobs on small brass parts that require extreme accuracy in shape and finish (such as valves, cocks, plugs and seats, triple-valve pistons, and many others) can be machined to advantage with carbide tools. The finish produced is such that grinding in with compound is often unnecessary; and tools stay sharp, enabling the operator to produce more work with a minimum of down-time for grinding.

On the many locomotive parts made of cast iron, Hunt-Spiller and other patented irons, it was early recognized

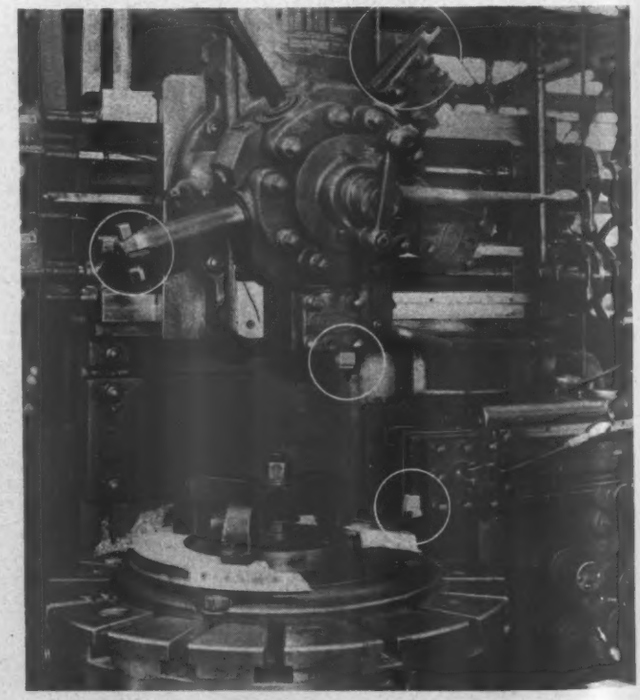


Fig. 2—Carbide-tool installation on a Bullard vertical turret lathe for machining driving-box hub plates—A special fixture is used for holding the work on the table

* Sales engineer, Firth-Sterling Steel Company.

that the use of carbide tools reduced the floor-to-floor time in machining such parts. On many machines, higher speeds could be used but in all cases better finish, greater accuracy of cut, minimum of tapering and, of course, longer tool life between grinds were realized—thus allowing the machine to be run more efficiently and turn out more and better work than by former methods.

This class of work includes cylinder bushings, valve bushings, rod bushings, piston bull-rings, valve bull-rings, pump cylinders, pump-cylinder bushings, hub plates, smoke stacks, and many other parts.

An installation of Firthite carbide tools on cylinder bushings uses three heavy tools for boring and turning. The surface cutting speed is 65 ft. per min.; feed $\frac{1}{16}$ in.; average depth of cut $\frac{1}{4}$ in.; pieces per tool grind, 25.

Fig. 4 shows Firthite tools machining piston bull rings —185 ft. per min. with .011 in. feed and $\frac{1}{4}$ in. to $\frac{5}{16}$ in. depth of cut; 25 pieces per tool grind. In reboring air compressor cylinders, as illustrated in Fig. 5, the tool, ground for a finish cut bores the cylinders in one pass holding to size and straightness without regrinding the tool for an average of 20 cylinders.

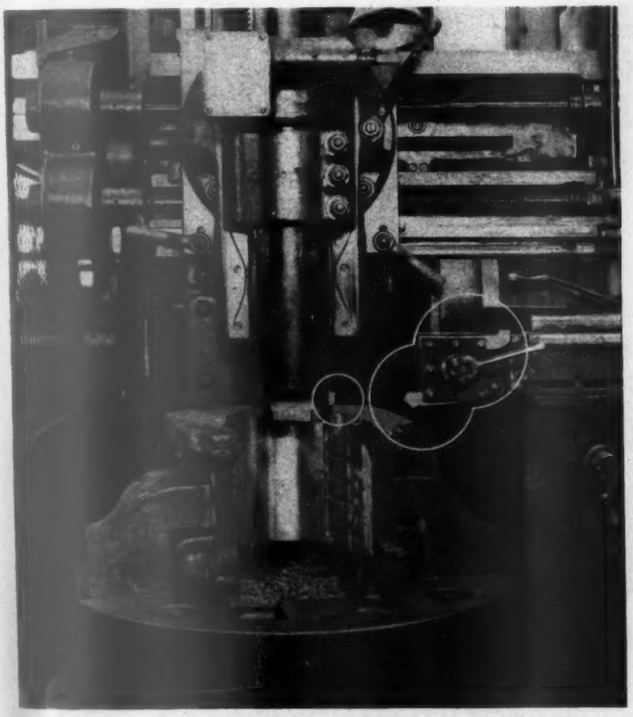


Fig. 3—Carbide tools used for boring a driving-box brass

Car Department Work

Car departments have many machining problems on which carbide tools are proving of great benefit where used in boring chilled cast-iron car wheels, finish machining car-axle journals previous to rolling, and machining car-journal brasses. An installation of carbide tools in boring bar where the cutting speed is 60 to 80 ft. per min., feed, $\frac{1}{8}$ in. to $\frac{1}{4}$ in. on roughing and $\frac{5}{8}$ in. on finishing, is an example. Several hundred wheels are bored per grind of tools. Since wheels are bored to fit different size axles, tools can be depended upon to hold to size for micrometer adjustments over long periods. This is important for finishing to the close limits made necessary for press fits.

A tool of equal benefit to the car shop is used in finish-turning axle journals before rolling. Used in pairs of one right-hand and one left-hand tool, they will produce

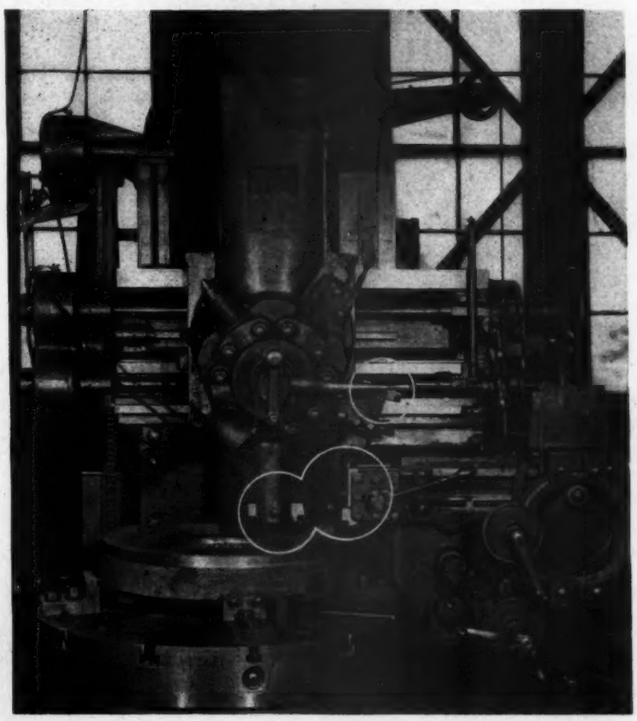


Fig. 4—In the finishing of piston bull rings the work is completed with the tools shown

better machined, smoother surfaces requiring less subsequent rolling.

Carbide Tools on Locomotive Parts

Locomotive parts frequently fail because of roughnesses and tool marks or checks on the finished part, which are often difficult to avoid with the ordinary cutting tools. Sintered carbide tools, such as Firthite, used in the machining of steel parts, can be operated at high speeds and fine feeds, producing machined surfaces of the highest quality and smoothest finish. To secure these results, it is important that the machine tools be either new or in good condition, with adequate power and speed range.

Several operations on which carbide tools have been successfully employed are: boring locomotive tires and machining driving axles, car axles, piston rods, link pins, trailer wheels, and bushings.

Carbide steel-cutting tools used for boring heat-treated

Fig. 5—Boring an air-compressor cylinder with a Firthite tool

locomotive tires on a 100-in. vertical mill at a speed of 120 to 130 ft. per min.; with a feed of .042 in. are able to turn out 12 to 14 tires a day. This compares with a production of six tires a day with previous tools. Another operation where steel-cutting carbide tools are used is the turning of driving axles. These are machined at 160 to 200 ft. per min. with .084 in. to .042 in. feed. About 1/32-in. stock is left for finish, which can be removed with one cut. This is an advantage over tools that require coarse feed and slower speed of work, often necessitating two cuts to get the desired finish to prepare the axle for burnishing.

Carbide tools are not a "cure-all" in the shop and are usually introduced on jobs where it is felt that the greatest benefits can be derived rather than on jobs where success is questionable. The handling of carbide tools satisfactorily necessitates proper instruction of machine operators in the fundamental requirements of each application. The co-operation of experienced carbide-tool engineers has proved valuable but it should be supplemented by the appointment of one or more men in the shop organization whose principal responsibility is the application of these new tools wherever they can be used to advantage. This plan is followed in large manufacturing plants, and, in railroad shops, can be made a part of the tool supervisor's activity and responsibilities.

An important factor in the successful use of carbide tools is proper grinding practice. Because of extreme hardness, cemented carbides cannot be ground on the same wheels used in sharpening other shop tools. Grinding is done with two types of wheels, either special silicon-carbide or diamond wheels. Grinding wheel recommendations for free-hand grinding with controlled table rest include: Roughing (straight or cup wheel) G-60-NW; 3,960/1—J+7, or 100-C-50 Diamond wheel. Finishing (cup wheel) G-100RW; 3,990/1-J7, or 320-C-50 Diamond.

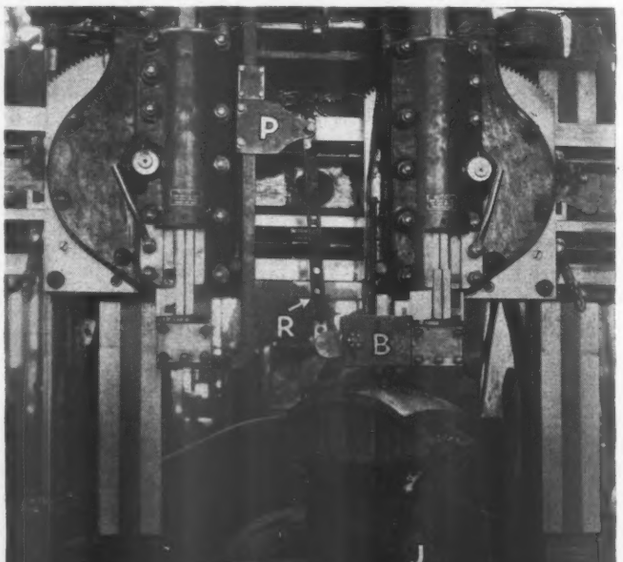
Accurate Machining Of Chafing Plates

An important feature of locomotive construction, particularly in relation to satisfactory operation on curves, is the drawbar and chafing-plate connection between locomotives and tenders. It seems obvious that the best results are secured when these chafing plates are accurately machined and well lubricated so as to offer a minimum resistance to sliding (with respect to each other) when locomotives and tenders are negotiating curved sections of track.

Referring to one of the illustrations, a Franklin stationary chafing plate, designed for application to the back end of a locomotive, is shown supported in a special jig which is bolted to the table of a Niles 52-in. boring mill, ready for machining the spherical surface which bears against one side of the floating chafing block, designed and applied so that the other side bears against the cylindrical surface of an adjustable chafing plate on the front of the tender.* The radius of the bearing surface of the stationary chafing plate is the same both ways and varies from 19⅞ in. to 37½ in., depending upon the class of locomotive. The governing factor in this radius is in reality the distance of the bearing surface from the drawbar-pin hole on the locomotive.

* For a suggested method of grinding the adjustable chafing plate see article on page 361 of September, 1941, *Railway Mechanical Engineer.*

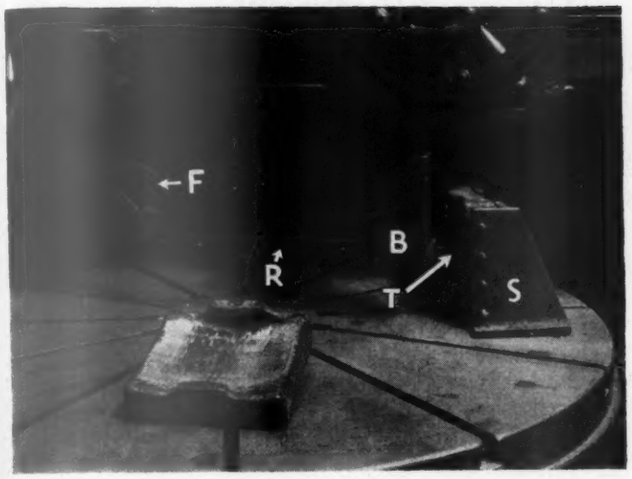
A study of the illustration shows that the stationary chafing plate is bolted to a welded-steel box-section jig, *J*, made of ⅞-in. boiler plate and mounted on a circular steel base plate which is bolted to the boring-mill table. The round-nose cutting tool is carried in a vertical sliding tool holder, *H*, guided in a heavy block, *B*, which is rigidly bolted to the lower part of the boring bar or ram carried in the right tool head. The cutting tool is moved up or down by means of lever connection from the radius bar, *R*, which is attached at the upper end to a fulcrum plate, *P*, bolted to the left tool head of the machine. The two heads of the machine are adjusted so as to bring the radius bar vertical when the cutting tool is at the highest point on the spherical surface of the chafing plate. With the work table rotating and horizontal feed applied to the right head, it is obvious that the round-nose cutting



Machining spherical bearing surface of Franklin stationary chafing plate with special jig on Niles 52-in. boring mill

tool will move vertically downward a small amount at first and then with greater speed, gradually forming a spherical surface of the correct radius, as determined by the length of the radius bar. The radius bar, itself, is made of ¾-in. by 1½-in. stock, drilled with holes to accommodate various lengths, as required. The fulcrum bracket is built up of 3-in. plates and carries a fulcrum pin, for connection to the radius bar. In machining the spherical bearing surface of Franklin stationary chafing plates, two cuts are usually taken in about one hour, with the setup shown.

Referring to the second illustration, the floating chafing block is set up in a special jib *S* on a Niles 84-in. boring mill, ready for machining the spherical bearing surface on one side. A finished floating plate is shown in the foreground on the boring-mill table. This method of machining floating blocks embodies the same principle as that previously described, but in this case the round-nose cutting tool, *T*, is supported in a sliding tool holder attached to the right end of the radius bar, *R*, and



Machining Franklin floating chafing blocks with the radius cutting tool on an 84-in. boring mill at the Albuquerque, N. M., locomotive shop of the Santa Fe

guided by block *B* at the lower end of the boring bar or ram in the right tool head of the machine. The construction of the light but rigid fulcrum bracket, *F*, bolted in the left boring bar tool holder, is clearly illustrated.

With the floating block secured by holding set screws in jig *S* and radius bar *B* set to the proper length, a spherical surface is formed on the floating plate when the work table is rotated and vertical feed given to the right tool head of the boring mill. Approximately one-half hour is required to set up and machine the spherical surface which forms one side of this floating block and fits accurately against the spherical surface of the stationary chafing plate on the locomotive. The reverse side of the floating block is machined to form a cylindrical surface simply by vertical feed of the right boring bar and cutting tool, without the radius attachment. This side of the floating block fits against the cylindrical surface of the adjustable chafing plate on the tender. In Santa Fe practice, when these floating chafing blocks become worn, they are brought back to standard size and shape by welding a layer of bronze on the worn surfaces and machining off excess metal by this method.

Boiler Patching Requires Care and Good Workmanship

By William N. Moore*

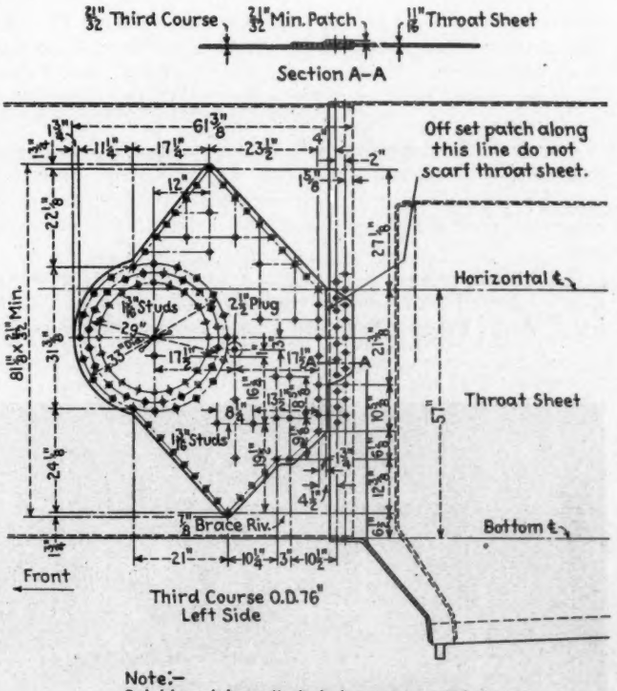
Prior to the enactment of the locomotive boiler inspection law of July 1, 1911, a patch on a boiler was just one man's job, the boilermaker's to whom the work was assigned. If he was a good boilermaker he was supposed to know enough to put on a patch and he worked only with the idea of "get her on" and "make her hold." Factor of safety, efficiency of seams, rivet size and spacing of plugs and patch bolts were of little concern so long as it held the caulking.

Today, however, the repairing and maintaining of boilers is a real problem and one that taxes the ingenuity of all concerned. Every move along the line must be made with precision. Making of the patch as designed by the engineering department, allowing for tapers, existing defects and previous patches, must be followed by equally good practice in application. Drilling, reaming of burrs from both sides of the plate, sanding new and old surfaces, cleaning off all foreign matter and fitting to gage are some of the practices which must be closely followed. Too many fit-up bolts cannot be used; one in every hole may be required in some patches. Riveting must be done with proper forming dies with proper pressures using rivets which have been heated to the correct temperature and which are not cold or burned.

For a job to be good it should also look good. Neatness is to be commended and encouraged.

The patch shown is not intended to illustrate an especially difficult application but it serves to show one of many types of situations which may confront a boilermaker. Cracks occurring in the third course of a boiler caused by the vibration of an air pump were covered and the shell reinforced by the application of the patch. The locomotive was a light passenger type carrying 190 lb. pressure in the boiler. The air pump was moved toward the front of the engine to eliminate the vibration which had caused the cracking.

After the removal of an older, smaller patch, the one shown was formed and applied. The back portion of the new patch is offset by hot pressing to take care of the existing outside throat seam. The throat sheet was not scarfed. All holes were drilled and burrs on both sides of the sheet were removed. Riveting was done by double gunning using No. 90 hammers operating off an



Note:—
Outside patch applied at air pump bracket studs on account of crack indicated thus— and for reinforcement. Remove old patch.
Drill 3/8" holes in ends of crack.
Make patch of 21/32" minimum boiler steel flange quality
Use 1" steel rivets unless otherwise marked.
Make rivets of steel with holes 1/16" larger than rivet sizes given. All studs in region of patch, to be riveted over on inside of barrel.
✦ Holes to be laid off from boiler.
✦ New holes to be drilled.
✦ Holes to be plugged in barrel of boiler girth. Dimensions taken on outside of third course stresses not changed.

Patch applied to third course of a boiler to reinforce cracked area resulting from air-pump vibration

* General boiler foreman, Pere Marquette, Grand Rapids, Mich.

air-line pressure of 120 lb. Rivets were heated with oil. Caulking operations were performed with hammers having 2-in. stroke using heavy and medium fullers. All rivets were caulked inside and out.

The water test made on the boiler was with 25 per cent excess pressure and under steam test the boiler was found to meet all requirements. After the patch had been applied the boiler was completely reinforced at check holes, washout holes and waist-sheet angles as insurance against future fractures.

Gisholt Saddle-Type Turret Lathes

Two new saddle-type turret lathes, known as the 3R and 4R, are shortly to be put into quantity production in the recently expanded and modernized Northern Works of the Gisholt Machine Company, Madison, Wis. Intended to meet the urgent wartime requirements for this type of machine tool, the new machines will be equivalent in most physical specifications to the Gisholt 3L and 4L turret lathes. In view of their design for large-scale production, however, the machines must be built on readily available machine tools and from materials obtained in the large quantities necessary. For this reason, also, these nearly identical machines will each be provided with the most commonly used tools and attachments.

General specifications for the machines are as follows: 3R—5¼-in. spindle bore; 21-in. chuck; 28½-in. swing over ways; 26-in. swing over carriage wing; 21½-in. swing over cross slide; 15-hp. driving motor. 4R—9¼-in. spindle bore; 24-in. chuck; 31-in. swing over ways; 27½-in. swing over carriage wing; 24½-in. swing over cross slide; 25-hp. driving motor.

Construction features will include a heavy semi-steel cast bed, well ribbed, with wide flat ways and undercut way for side carriage. A pressed-steel coolant pan with reservoir is provided between the bed and the cast-iron legs.

The headstock is a separate semi-steel casting accurately aligned with and securely bolted to the bed casting. Walls extend above all shafts so that bearings are seated in solid metal. All headstock shafts are mounted in anti-friction bearings. Four spindle speeds are provided through high-low multiple-disc clutch, jaw clutch, and semi-steel gears. Eight spindle speeds are available through a two-speed motor, and reverse spindle speeds by a reversing motor. A single lever starts and stops the spindle and selects the high or low multiple-disc clutch. A single lever operates the jaw clutch. All gears and bearings are splash lubricated.

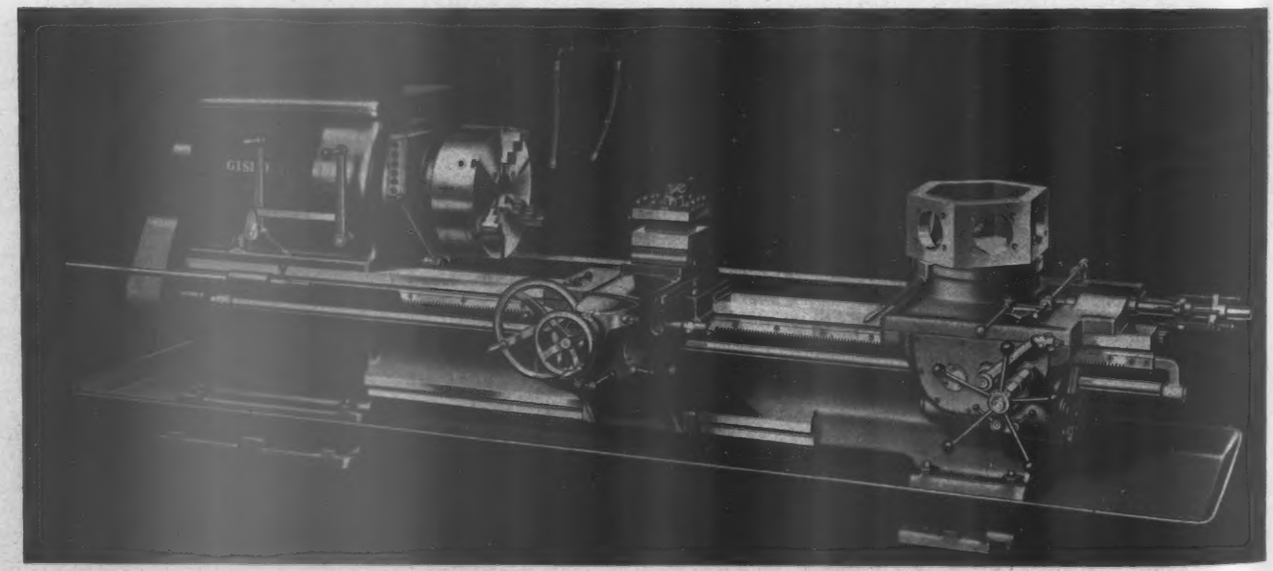
The heavy semi-steel eight-speed spindle has an American standard flanged-type spindle nose and is mounted in two double taper roller bearings, one at the front and one at the rear. No revolving gears are mounted on the spindle. A hand-operated brake operates on the flanged spindle nose.

The feed change gears are mounted on a quadrant in the feed gear train. The gears furnished provide for a range of fine and coarse feeds in addition to the middle standard range which is best suited to average requirements.

A side carriage of the full-swing type is mounted on the wide front way with square lock construction, and flat taper gibs give adjustment on both front and lower ways. The cross slide is mounted on a dovetail with taper gib for adjustment. The cross-feed screw has a micrometer dial. The box-type closed apron is supported by the lower undercut way. All shafts are mounted in anti-friction bearings. Four longitudinal feeds are available in one direction and four cross feeds in both directions. Cross feeds are one-half the longitudinal feeds. The longitudinal automatic feed trips by means of a six-position stop roll. The steel square-turret tool post, mounted on the cross slide, is locked by a powerful sleeve clamp and provided with an auxiliary side clamp. It is indexed by hand after releasing the clamps and raising the tool post from the indexing pin.

The turret carriage, of heavy bridge construction, is aligned by the front way and secured to the rear way with a square lock gib. A flat taper gib provides for adjustment on the front way. A box-type closed apron is used with shafts mounted in anti-friction bearings. Four longitudinal feeds are engaged through a friction clutch. Automatic feed trips are available for each face of the hexagonal turret, indexed with the turret.

The hexagonal turret is a hollow semi-steel casting



Gisholt saddle-type turret lathe, built in two sizes with 28½-in. and 31-in. swing, 5¼-in. and 9¼-in. bore

mounted on an anti-friction bearing on the turret carriage. An external double-bevel clamp ring has a toggle lock. The single lever at the front releases the clamp ring and withdraws the indexing pin. A full-length lead screw and taper attachment are optional. Standard tool equipment supplied includes 14 separate items and an extra bar tool set for the 3R machine is optional.

Cylinder Head Seat Grinder

A portable rotary surface grinding machine which trues and refinishes the cylinder-head seat on locomotive cylinders without the necessity of removing studs has been developed by the R. J. McQuade Company, Chicago, and is now being used with satisfactory results at a number of railroad shops. With the former method of mechanically or manually grinding the individual head to its own cylinder, tests at one shop indicated that an average of six man-hours per cylinder joint are required, whereas with the use of this machine, the operation is

McQuade rotary surface grinder refinishing cylinder head seat without the necessity of removing studs

performed in an average on one man-hour per cylinder joint. The speed and ease with which the machine performs the operation is quite important, but the principal advantage is the accuracy and smoothness of the work since, with proper attention to the seat on the cylinder head, a steam-tight and trouble-free joint is assured on the first trial.

The machine is light and simple in construction. It is held in place in the cylinder by a four-point spider set near the edge of the cylinder bore and is equipped with pointed adjusting screws which are used to make the center line of the revolving balanced grinder arm coincide with the center line of the cylinder. A ½-hp. universal electric motor, with cup-type grinding wheel, is mounted on a cross-feed slide at the outer end of a rotating arm which telescopes the center housing and is adjustable in length for different cylinder diameters. Three extensions of different lengths are supplied to take care of the entire range of cylinder sizes. The cross-feed slide permits adjusting the grinding wheel to give a light or heavy cut on the cylinder joint, as desired. Grinding is accomplished with the cup-type grinding wheel which is 2½ in. in outside diameter, by 1 in. inside diameter, by 1½ in. long. The cup grinding surface is, therefore, 1½ in. wide. The grinding wheel has a leaded back ½ in. thick and is applied to the motor spindle between compression washers in the usual way.

In using this electric-driven machine, the grinding wheel is enabled to rotate about the center line of the cylinder by means of a slip-type plug-in mounted at the center of the spider. The grinding wheel, in its position on the balanced arm, will rotate itself about the circle when properly tilted, but experience at the shop mentioned indicates that best results are secured when the grinding wheel is slowly revolved by hand. The cylinder-head seat may be faced on a boring mill using a finishing tool with a carbide cutting tip which produces a highly-polished and evenly finished surface. A number of railroads, however, prefer a complete grinding job, in which case cylinder heads are chucked in a boring mill or engine lathe, and an electric-driven cup-grinder, similar to the one shown but arranged for mounting in the lathe tool post, is used to finish the cylinder-head seat accurately and smoothly.

Locomotive Boiler Questions and Answers

By George M. Davies

(This department is for the help of those who desire assistance on locomotive boiler problems. Inquiries should bear the name and address of the writer. Anonymous communications will not be considered. The identity of the writer, however, will not be disclosed unless special permission is given to do so. Our readers in the boiler shop are invited to submit their problems for solution.)

Correction — Why Was the Smoke-box Damper Eliminated?

Q.—What is the reason for eliminating the damper in the smokebox of the modern locomotives?—M. R. K.

A.—The following corrections are made to the answer given in the March issue: The manufacturer's practice is to include the smokebox damper with all superheater equipment, when the throttle is located in the dome. When the front end throttle is installed, it is not required by reason of the fact that the units are protected at all times by steam.

This applies to any type of superheater when the front end throttle is used. It is quite true that dampers are left out in many locomotives and can be done successfully today with the forged return bend type superheater unit where welds and other forms of joints are not used in fabricating of the unit. However, the life of the unit without protection of the damper is still unprotected, as it is the material that is protected against overheating by application of the damper.

Correction — Three Ways to Cure A Leaking Throttle

Q.—We have equipped several Pacific type locomotives with multiple throttles and find that we have trouble with leaky throttles. What causes this condition? Is it due to the expansion of the boiler? Can this condition be remedied by increasing the length of the throttle rod when the engine is hot so that the pilot cam just clears the top collar of the pilot valve?—F. I. R.

A.—The first and third methods of correcting a leaky throttle as outlined in the March issue do not meet with the approval of the manufacturer; the second method, "the use of a compensating lever," is the manufacturer's recommended practice for overcoming leakage due to the valves lifting when the boiler expands.

In some earlier designs the compensating lever was not used, but the valves and cam shaft are designed with enough play between the lifting and pull down sections of the valve and cam to compensate for considerable expansion in the boiler without raising the valves, provided they are properly set when the boiler is cold.

Repairing Leaking Staybolts and Holes

Q.—We have considerable trouble with firebox side sheets, due to leaky staybolts and staybolt holes checking. Should the side sheets be renewed when these conditions are found? What can be done to overcome this condition?—J. F. D.

A.—An examination of the side sheets should be made to determine the extent of the checking of the staybolt holes. If a considerable area is involved, part side sheets should be applied to include the entire area affected. If this condition exists to any extent at general shopping it is advisable to renew the side sheets rather than risking the necessity of renewing the sheets between shoppings.

Leaky staybolts, due to enlarged holes or distorted threads, can be repaired by applying larger size staybolts or by reducing the size of the hole and retapping. This is done by either of two methods, depending largely upon the equipment available:

First—By closing up the holes by oxyacetylene welding. This is done by depositing metal from a ⅛-in. welding rod and then reaming and tapping the hole to the standard staybolt size. By the use of the proper welding rod metal can be deposited which is readily reamed and threaded.

Second—By applying steel bushings. In applying steel bushings, the worn staybolt holes are reamed out considerable oversize. Steel sleeves are then inserted in the holes and welded in place, the sleeve having been previously tapped out for a standard staybolt. With this method of repair, the sleeve can readily be cut or driven out, should the staybolt hole in it become enlarged.

There are numerous causes for radial cracks developing from the staybolt holes, such as bad water conditions, improper firing, expansion and contraction of the sheets, and improper application of the staybolts.

Through any of these causes staybolts start leaking; they are then driven up, this continual working on the staybolts sets up strains in the sheets which, together with expansion and contraction, cause the sheets to crystalize and crack. Proper application of the staybolts would reduce this condition to a great extent. Holes in side sheets should be punched out and reamed before tapping.

Shoe and Wedge Milling Fixture

The illustration shows a holding fixture used to support driving-box shoes and wedges while being machined on a modern Milwaukee milling machine, installed at the Santa Fe shops, Albuquerque, N. M. The fixture, which is mounted on a 22-in. by 108-in. work table, grips the shoe, or wedge flanges sufficiently firmly to hold the work during any ordinary cut. Adjusting screws are used to level the shoe and hold it in accurate alinement for the milling machine cut. Five-inch solid high-speed steel cutters are used for the particular job, and the shoes and wedges are finished to size for the frame jaw to fit with one roughing and one finishing cut. The cutter speed is 21 r.p.m. and the feed about 1⅞ in. per min.

Milling machine and holding fixture used in machining shoes and wedges at the Santa Fe locomotive shops, Albuquerque, N. M.

Large-capacity armored rubber hose conducts an ample supply of coolant to the milling cutter to support maximum cutting speeds and feeds. On the left column of the machine is a sheet-metal holder designed to carry a card marked with the name of the man regularly assigned to operate the machine. The practice of applying individual name cards to machines in this shop has been found to produce good results, since the operators are thereby encouraged to take a personal interest in their respective machines, to keep the machines and surrounding premises clean and, above all, to see to it that the machines are always in good condition and adjustment.

Plastic Gasket and Pipe Thread Compound

An easily applied plastic gasket or pipe-thread compound with a wide range of applications is manufactured by National Engineering Products, Inc., Washington, D. C. Known by the trade name Copaltite this sealing agent has been used in many industrial, marine and boiler plants to seal joints of almost every type. Used as a plastic gasket, it resists pressures up to 6,500 lb. while on threaded joints it holds pressures to 10,000 lb. The temperature range of the material is from minus 315 deg. to plus 1,500 deg. F. and throughout this range it is unaffected by vibration, contraction or expansion. Copalite remains unaffected chemically or physically in lines carrying refrigerants, benzine, gasoline, salt brine, oils, greases, ammonia, alcohol, alkalis, gases and diluted acids.

Best results are achieved by the observation of a few simple rules in application either of the liquid sealer which is intended for use on smooth, highly machined surfaces and pipe threads, or the cementing compound used on rough surfaces, warped flanges or unfinished parts.

Questions and Answers On Welding Practices

(The material in this department is for the assistance of those who are interested in, or wish help on problems relating to welding practices as applied to locomotive and car maintenance. The department is open to any person who cares to submit problems for solution. All communications should bear the name and address of the writer, whose identity will not be disclosed when request is made to that effect.)

Boiler Check Carrier

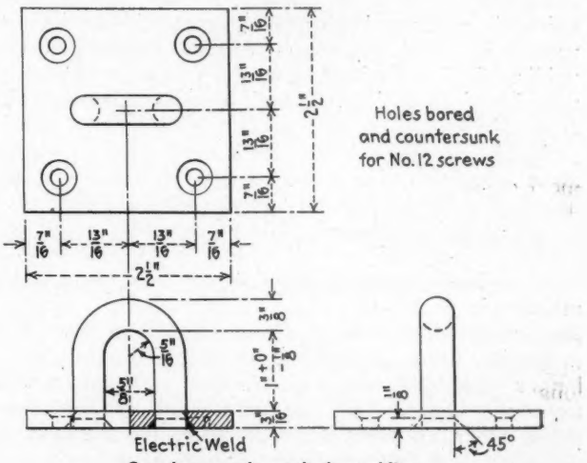
Q.—Can you suggest a welded carrier for boiler check reseating tools? We use three or four types of tools and it is not easy to carry all of them when climbing up onto the running board.

A.—Cut a piece of $\frac{3}{16}$-in. tank steel about 4 in. wide so that it can be drilled to hold the check tools. The length should be sufficient to accommodate the number of tools to be carried, (about 18 in. for three and about 21 in. for four). A section four inches from each end should be bent at right angles to form legs. Make a handle of $\frac{1}{4}$ in. round iron and weld it on. If the center of the tool has a tendency to slide through the hole in the plate, make a short shelf of $\frac{1}{8}$-in. plate and weld this directly underneath the tool.

Making Car Door Staples

Q.—For cars that use the old hasp and staple closing arrangement, it is sometimes difficult to secure the heavy staples. How can a substitute be made?

A.—The easiest way to make the staple would be to bend the round part of the staple around some sort of a jig. Use $\frac{3}{8}$-in. round stock and make the opening about



Car door staple made by welding

$\frac{5}{8}$ in. by 1 in. A piece of $\frac{3}{16}$-in. plate is cut $2\frac{1}{2}$ in. square. This is drilled and countersunk for No. 12 screws. The $\frac{13}{32}$-in. holes in the center that hold the staple are countersunk on the opposite side from the screw holes. The staple is forced into the plate with the ends of the staple flush with the bottom of the plate and held this way in a vise. A bead of weld is placed around each staple end in the countersunk provided for it. This should make a rugged staple and no finishing will be needed on the back side.

Removing Grease Spots From Floors

Q.—I have heard that grease spots could be removed with the welding torch. Is this possible, and how is it accomplished?

A.—Grease spots can be removed from car floors with a welding torch. Before starting all dust and dirt is swept from the area to be heated. A pail of water is placed near by in case it is needed. A welding torch with a medium welding head is lighted and adjusted to an excessive acetylene flame. The flame is brought to within 4 or 5 inches of the spot and moved about slowly. The heat from the flame draws the grease to the surface and destroys it. Care must be exercised not to char the car floor.

Reclaiming Worn Spring Equalizers

Q.—The short spring equalizers on some six-wheel passenger car trucks wear at the ends where they fit on the short hangers. What method of repair is suggested?

A.—Several roads have tried to weld plates on these short equalizers without success. One method is to fill in the wear with steel rod. When the applied metal is within a $\frac{1}{16}$ in. or so of the proper height, finish with tire steel using a slightly carbonizing flame. Care must be exercised when rebuilding these equalizers that they are not built too thick for the space where they enter the hanger.

Periodic Attention To Passenger Cars*

By E. L. Schaffner

Previous papers presented here in the past have covered periodic attention to freight cars and daily inspection and maintenance of Pullman cars. It is my thought to summarize briefly the various periodic operations required in order to keep passenger cars in service, avoid road delays and eliminate criticism from the traveling public. I shall make a few suggestions which I hope may be of some interest and benefit to our members, especially those in freight yards who are being called on to handle passenger trains in freight service more and more frequently due to movement of trains of troops, defense materials and army equipment.

A regularly followed plan of periodic attention to passenger cars, as well as to any other pieces of railroad or industrial equipment, and even our own automobiles is necessary. This is particularly essential at the present time to keep the maximum number of cars in service, as many cars are being held out of shop for longer periods between class repairs. Various railroads usually designate some assigned point for the maintenance work on certain cars, taking into consideration the amount of time available for such work, with a view to keeping cars from missing their runs. This is an important factor, as the cutting out of certain types of passenger cars, such as deluxe coaches, diners or special type Pullman cars for which there are no replacement cars, results in criticism from the traveling public and in the case of diners, causes considerable confusion and rearranging of dining-car crews. While the A. A. R. Rules cover time limits on air-brake cleaning, and journal-box attention, other periodic operations on the various roads depend on several factors, such as the amount of mileage made by cars, territory through which cars are operated, and length of time cars are out of shop between class repair periods.

Parts Requiring Periodic Attention

The periodic operations on passenger cars can be roughly divided into six groups, covering the following:

Air-Brake Attention

A. A. R. Rules designate a 15-month period of air-brake cleaning for type UC air brakes, and 12-month period for other types of passenger air-brake equipment, except for the new D22A equipment, for which no time limit has as yet been specified, but which we are cleaning on a 15-month basis on our railroad. In addition to the air-brake details which are taken care of at this time, it is advisable to make a thorough check of trucks and brake-rigging conditions, and make necessary repairs to insure continued operation of cars without trouble. Special attention should be given to renewal of worn brake-rigging parts such as cotter keys, hangers, key bolts, gibs, levers, brake beams and heads.

A thorough check of couplers and draft gear should also be made. Loose pedestal and tie-strap bolts should be tightened or renewed, and greasing of center plates and adjustment of side bearings, especially on passenger carrying cars, should be given attention. Lubrication of other parts which are subject to wear or to developing annoying squeaks, such as buffer stems, coupler carrier irons, diaphragm springs, etc., should be taken care of at this time. A thorough "boilerwash" job at the time of this air brake cleaning should keep a car in good running condition for many months without cutting it out for this work.

Journal Box Attention

This job is of the utmost importance in passenger-train operation, especially in view of the number of new men on various railroads now performing this work. Practically all roads follow the six-month period of journal-box attention, as given in the A. A. R., except in cases of some high-mileage cars, which are caught more frequently. It is certainly false economy not to replace a journal bearing at the time of this inspection if there is any question of it giving six months' service.

While we do not want to use bearings wastefully, men should receive careful coaching on this feature, as well as proper instruction in the examination of wedges and the repacking of the boxes in the prescribed manner. Air brakes can be cut out when defective, broken or leaking steam lines can usually get through to the next division point, but a hot journal on a passenger train may result in having to cut the car out at some intermediate point. In some cases this necessitates awakening sleeping Pullman car passengers, which causes bad road delays and inconvenience to and criticism from the traveling public. In the case of roller-bearing wheels, which are being used in increasing numbers in passenger trains, a periodic examination and the filling of boxes to proper height is very important. Oiling periods vary on the different types of bearings, but the usual filling period is every 30 days. While a close daily inspection should be made of roller-bearing boxes at the time of regular inspection, special attention should be given at the time of filling the boxes to check for leaking boxes or gaskets, loose studs, worn filling plugs, etc.

Steam-Heat Attention

This item is of the utmost importance to the traveling public from the standpoint of comfort and to satisfactory railroad operation during the winter months. A thorough inspection and test of all steam-heat details on passenger cars, such as metallic connectors, steam end valves, regulators, steam inlet valves, pipe covering, radiators, thermostats and the overhead heat unit, should be made and defective parts renewed before the start of the steam-heat season. It is advisable to make this campaign in August and September so that cars will be in serviceable condition at the time of the first cold spell.

Electrical Apparatus

The attention to electrical equipment on passenger cars will differ on the various roads, depending on the conditions under which cars are operated. However, on any road, a periodic check of batteries, generator brush racks and generator brushes, regulators and parts, car wiring, etc., should be carefully performed. A careful periodic inspection should also be made of the generator drive, whether it be the flat-belt type, cog-belt type or propeller-shaft drive. Lubrication of drive and other parts of the electrical system is also essential to insure good lights at all times for our railway mail clerks, railway express employees and the travelers.

Air-Conditioning Apparatus

While air conditioning on passenger cars is comparatively new, nothing has done more to attract the traveling public back to the railroads, and any failure of the system, especially in the new type cars with sealed win-

* From a paper presented before the March 17 meeting of the Car Department Association of St. Louis. Mr. Schaffner is gang foreman of the Pennsylvania at St. Louis, Mo.

dows, is a serious cause of complaint. The attention to this equipment will also vary on different railroads as some cars are in cooling service the year round and others are only in service during the summer months. A careful annual overhaul job is essential to place cars in condition for the air-conditioning season and at this time, on mechanical-systems cars, close attention should be paid to all compressor details, piping, thermostats, relays and contacts, refrigerant used in the system, standby motors, batteries, generator, air filters, blower fans and motors, etc.

In the cars which have ice system of cooling, similar items should be given attention and, in addition, spray systems, ice bunkers and doors, pump strainers, water pumps and motors should be thoroughly checked. Attention, adjustment and inspection of these items periodically during the air-conditioning season is necessary to keep the systems running without trouble.

Car Cleaning

Probably the item which the traveling public observes more closely than any of the above is that of car cleaning. While daily interior and exterior cleaning of passenger cars is done at every terminal, a program of periodic interior and exterior cleaning is necessary to keep cars in good condition and suitable for our passengers. The frequency for this work also varies among the roads, depending on individual cars, but the exterior of cars should receive extraordinary cleaning with approved cleaner often enough to keep them looking a credit to the road on which they are operating. Likewise, interior extraordinary cleaning should be done frequently enough to keep the headlining, side walls, seats and cushions, toilets, wash rooms, floors, etc., thoroughly clean at all times.

A skilled painter should also be available when extraordinary cleaning is completed to touch up cars as needed and restore the paint to the original condition, especially in toilets and wash rooms. Drinking-water tanks, coolers and filters should also be cleaned at prescribed periods and the water kept thoroughly clean and pure at all times.

Dealing with Passenger-Refrigerator and Pullman Cars

I might mention one job that troubled all railroads in the St. Louis Terminal for quite a while but which is now being satisfactorily handled. The suggestions as given in the preceding pages as regards periodic attention are followed religiously on many railroads on their own equipment but in the case of cars of private ownership (R. E. X.-P. F. E.-N. R. C., etc.) and Pullman tourist type cars used in troop movement, little or nothing was done on these cars until they were ordered out. As a result, in many cases, a road was offered cars for movement on their line on short time, which had come in on other roads, many of which were overdate for air-brake and journal-box attention, or had defective wheels, steam-heat defects, etc. A plan has been inaugurated whereby extra inspectors are put on to keep in close contact with the Pullman Company and make prompt inspection of all Pullman tourist cars in the St. Louis area. In the case of any overdate air brakes, journal boxes, or other work required before they could be moved, the cars are shipped back to the road which had previously brought the cars into St. Louis, and they make the repairs. This has resulted in keeping these Pullman tourist cars repaired much more promptly and ready to move in most cases when needed.

A similar procedure should be followed with passenger-refrigerator cars, especially those of private ownership, many of which will start to move through this gateway very shortly for strawberry loading in the Missouri-Arkansas strawberry fields, and with which all roads experienced trouble last year in movement over their line.

I have only endeavored to cover this subject in general and have not mentioned conditions which are developed in daily inspection, such as wheel defects, etc. With the present volume of passenger traffic, it is essential that all cars possible be kept in service and a close adherence to a plan of regular periodic attention will result in keeping cars in service the maximum amount of time.

Improved Impact Wrenches Increase Shop Production

Well-known and widely-used in railroad shops, impact wrenches manufactured by the Ingersoll-Rand Company, Phillipsburg, N. J., have been increased in range of application by the addition of Size 504 and Size 508 models. The Size 504 is for nuts up to and including ⅜-in. bolt size, the 508 has a capacity for nuts up to ⅝-in. bolt size. Light in weight and sturdy in construction

Size 508 Impact wrench, with adapter, tightening ½-in. floor bolts

these new tools use a patented principle for localizing steel-to-steel impact without transmitting shock and subsequent wear to other parts of the tools.

Reversible in operation these wrenches are so designed that no reversing gears are used. Torque action has been reduced so that one-hand operation is possible and small nose diameter and short over-all length permits operation in close places.

Decisions of Arbitration Cases

(The Arbitration Committee of the A. A. R. Mechanical Division is called upon to render decisions on a large number of questions and controversies which are submitted from time to time. As these matters are of interest not only to railroad officers but also to car inspectors and others, the Railway Mechanical Engineer will print abstracts of decisions as rendered.)

Term "Worn Out" Sufficient Description For Journal-Bearing Renewal

On September 21, 1940, the Gulf, Mobile & Ohio repaired Georgia Rosin Products Company car GROX Car No. 80 and included in its bill an item of $4.08 for replacing four journal brasses, giving as its reason for the replacement the fact that the old ones were worn out. The car owner took exception to the bill on the ground that the term "worn out" did not appear as one of the six different reasons for making such repairs under Section (j) of Rule 66. The G. M. & O., in its statement, said that while Rule 66 specifically mentions six defects for condemning brasses, the term "worn out" would define the defects under Items 2, 4 and 6.

In a decision rendered April 10, 1941, the Arbitration Committee ruled that the term "worn out," when used to describe the cause for removing a journal bearing, is generally recognized as representing one or more of the conditions under paragraph (j) of Rule 66 and on that ground the contention of the Georgia Rosin Products Company was not sustained.—*Case No. 1785, Georgia Rosin Products Company versus Gulf, Mobile & Ohio.*

Air Brake Questions and Answers

HSC High-Speed Passenger Brake Equipment

1—*Q.—What is this equipment designed for?* A.—For passenger trains operating in ultra high-speed service.

2—*Q.—What is the object of the brake as so designed?* A.—To obtain shorter stopping distances and freedom from slid wheels.

3—*Q.—Why is there a need for such a brake at this time?* A.—Because of the step-up in all train speeds of the modern type, it is absolutely necessary to furnish more modern and effective control.

4—*Q.—How is a more effective control achieved?* A.—By improving any elements that may be associated with the problem of train retardation.

5—*Q.—What elements enter into this problem in their order of functioning?* A.—(*a*) Means for transmitting the desired brake action from the engineman's brake valve in the locomotive to the last car in the train. (*b*) The triple valve which controls the flow of air to and from the brake cylinder. (*c*) The brake rigging which conducts the force from the source of power to the brake shoes. (*d*) The brake shoes. (*e*) The wheels. (*f*) The running rails.

6—*Q.—What improvement is made with the transmitting elements?* A.—As the pneumatic form of transmission is definitely limited in its speed of functioning, which limit has been practically reached with modern pneumatic devices, it is necessary to incorporate a substitute in order to effect an appreciable saving in time from the brake-valve movement to the brake action throughout the train. This improvement is accomplished by the use of electric action.

7—*Q.—Why is this improvement satisfactory* A.—This action, being practically instantaneous, results in a material decrease in stopping distance.

8—*Q.—Give an illustration of such saving.* A.—Assuming an 18-vehicle train, including the motive power, the time of pneumatic transmission from the locomotive to the last car is about 4½ seconds, while the time of electrical transmission is virtually zero. At a speed of 100 m. p. h., train movement is 146 ft. per second. In consideration of the above comparison, it can be easily understood that the stopping distance is cut down considerably.

9—*Q.—What improvement is made with the operation of the second element (the triple valve)?* A.—As the triple valve is moved to its various operations by the transmitting element, an additional device is provided, which automatically regulates the braking force proportional to its speed. This device makes it possible to employ a much greater braking force in the high-speed zone than was previously possible.

10—*Q.—Why is this augmented braking force in the high-speed zone beneficial?* A.—Because the brake shoe friction decreases and distance traveled per second increases rapidly with increased train speed.

11—*Q.—What improvement is made in connection with the third element (the brake rigging)?* A.—Higher efficiency in force transmission is obtained through the reduction in weight and number of parts incident to mounting the brake cylinder on the trucks instead of the car body.

12—*Q.—Discuss briefly the last three elements mentioned.* A.—A new form of brake shoe is under consideration and will be discussed elsewhere. The braking portion of the wheel's work is taken over by a new friction element associated with the brake shoes. Through the use of the new device that regulates the brake-cylinder pressure in proportion to the speed and the one that counteracts the ill effects of low adhesion. As will be shown, cases of slipping wheels will be limited to the occasional instances when rail adhesion is sub-normal, as occasioned by water dropping on the track from the train or oily spots encountered at highway crossings.

13—*Q.—What are the important features of the HSC equipment?* A.—(*a*) Suitable for either ultra high speed or conventional passenger trains of one to 24 cars. (*b*) Fast application and release with self lapping electro-pneumatic control to afford maximum flexibility and smooth operation. (*c*) Speed governor control of braking pressures in conformity with speed, for the purpose of holding the retardation effort of the brake shoes as nearly uniform as practical. (*d*) Improved pneumatic brake operating features when used in conventional passenger service. (*e*) Pneumatic emergency brake immediately available by use of brake valve emergency position in the event that the electro-pneumatic brake does not function normally. (*f*) Pneumatic emergency brake obtainable at any time equipment is charged by means of the brake valve, conductor's valve, or ruptured brake pipe or connections. (*g*) Higher braking force available for emergency than for service to offer needed protection for unexpected emergencies during service stops.

* This is a new series of questions and answers. As in previous series references to figure and part numbers are to the manufacturers' instruction pamphlets.

Parts of the Equipment

14—*Q.—Name the parts which make up the equipment.* A.—Referring to Fig. 15 (Instruction Pamphlet No. 5064, Supplement 22) D-22-BR control valve; an F-1864, or FS 1864 relay valve; A-2 continuous quick service valve; combined auxiliary, emergency and displacement reservoir; No. 21 B-magnet bracket; brake cylinders; supply reservoirs, B3B conductor's valve; E-3 brake application valve; combined dirt collector and cut-out cock; automatic slack adjuster. Various cut-out cocks, hose connections, dummy couplings, branch pipe tees, piping, etc., are also used. The water raising system is not a part of the air brake system, but air pressure for its operation is supplied from the system. The train air signal system is not a part of the brake equipment and will be discussed later. Referring to Fig. 16, other parts are as follows: Axle generator; relay cabinet; plug connector; thermo-flip-on switch; contactor; back-up valve.

15—*Q.—What are the functions of the D-22-BR control valve?* A.—This valve corresponds in a general way to the universal valve now in common use. It is designed as a piloting device for operation of one or more large capacity relay valves. It operates to control the admission of air to, and exhaust from the relay valves, and to charge the reservoirs.

16—*Q.—What are the functions of the relay valves?* A.—To relay the application and release operation of the control valve. The FS 1864 relay valve is used on cars having speed governors (in this installation the first and last cars of the train). All other cars and Diesel power units have the F-1864 relay valve. The two types are similar with the exception that F-1864 does not have the K-3 switch portion.

17—*Q.—What are the functions of the continuous quick-service valve?* A.—To transmit local quick service activity from car to car to provide fast transmission of the brake pipe reduction, particularly on successive brake pipe reductions following the initial reduction.

18—*Q.—What are the functions of the combined reservoirs?* A.—(*a*) Auxiliary reservoir provides the air supply for proper functioning of the control valve service portion. (*b*) The emergency reservoir is used to provide the quick recharge, graduated release and the high emergency pressure features. (*c*) The displacement reservoir provides the required operation volume to develop the proper relation of the brake pipe reduction.

19—*Q.—What are the functions of the No. 21-B magnet bracket?* A.—To apply or release the brakes on the car during the HSC electro-pneumatic operation.

20—*Q.—How do the brake cylinders function?* A.—As in all cases, cylinders with piston rods so connected through the brake levers and rods to the brake shoes that when the pistons are forced outward by the air pressure, this force is transmitted through the rods and levers to the brake shoes and applies them to the wheels.

21—*Q.—What are the functions of the supply reservoirs?* A.—To supply air to the brake cylinders.

22—*Q.—What are the functions of the B-3B conductor's valve?* A.—To permit the conductor to apply the brake in case of emergency.

23—*Q.—How does the E-3 Brake application valve function.* A.—To vent the brake pipe when actuated by the conductor's valve.

24—*Q.—What is the purpose of the combined dirt collector and cut-out cock?* A.—The dirt collector prevents the entrance of pipe scale, sand, cinders, or foreign particles of any kind into the control valve. The cut-out cock provides a means of closing the brake-pipe connection between the control valve and the brake pipe.

25—*Q.—How does the slack adjusted function?* A.—Maintains a predetermined brake cylinder piston travel.

26—*Q.—What is the purpose of the axle generator?* A.—To register train speed. One generator is mounted on an axle of the first car and one on the last car of the train in this installation.

27—*Q.—How does the relay cabinet function?* A.—It limits the brake cylinder pressure in proportion to the train speed. One each is also located on the first and last cars in this installation.

Pulp Wood Cars For the M. P.

The illustration shows one of a series of 150 pulp-wood cars recently constructed at the De Soto, Mo., shops of the Missouri Pacific, and assigned to service in the Southern and Western districts, where a total of 418 of these cars are now in use. The same underframe construction is used as with Missouri Pacific standard flat cars and consists of fish-belly-type side and center sills. The steel ends and end side panels are applied for the purpose of supporting the pulp-wood load. These cars are 44 ft. 6 in. long over the coupler pulling bases and 31 ft. between truck centers. The ends are 9 ft. 1⅜ in. high and the side panels are 61½ in. wide.

Missouri Pacific pulpwood car which has an average light weight of 44,600 lb. and capacity to carry 21 cords

High Spots in

Railway Affairs . . .

N. Y. C. Employees Donate Bomber

New York Central employees, with a suitable ceremony in the Grand Central Terminal in New York on Sunday, April 19, turned over to the United States Army a check for $165,000 for the purchase of a bombing plane. Russell M. Church, a draftsman with that railroad and father of Lieut. R. M. Church, Jr., who was killed in action in the Philippines in January, was selected to make the presentation The occasion was dramatized by the presence of a detachment of troops and a military band, and was presided over by James A. Farley, former postmaster general.

Training of Supervisors

One of the most serious problems involved in the gigantic effort to increase production of war materials has been that of supervision. There have not been enough trained foremen and supervisors, and many of those occupying such positions have not had the advantage of the most up-to-date practices. Recognizing this, the Federal Security Agency has found it possible to introduce classes of various sorts in hundreds of accredited colleges and universities throughout the country. Information about these classes is set forth in circular E. S. M. D. T.—Misc.—258, which may be obtained from the Federal Security Agency, U. S. Office of Education, Washington, D. C. A number of employees of the New York Central have been very much impressed by the value of a course entitled "Foreman or Supervisory Training," which they are now taking at New York University.

How to Overcome Labor Shortages

The railroads are becoming seriously embarrassed by the labor shortage which promises to become more and more critical. Greatly increased business on the one hand, and the draft on the other, make it necessary to adopt positive and constructive measures to protect themselves in this respect. The Office of Defense Transportation, which has been making a critical study of the problem, suggests: (1) Raise the hiring-age limits and relax physical requirements. (2) Make a drive to rehire former employees, including those who have quit and those who have retired. (3) Utilize all state and federal aids to improve apprentice and learner training methods, and speed up apprentice training by agreement with labor. (4) Survey situation on each railroad to determine possibilities of upgrading employees to more skilled positions and utilizing more skilled workers to instruct and guide semi-skilled workers. (5) Employ women wherever possible. (6) Make full use of governmental employment services. (7) Establish a clearing-house by which the various railroads can exchange information on man-power and self-help measures. (8) Organize effective personnel management system for each carrier under appropriate supervision and direction.

Opposes Setting Clocks Ahead

There is a strong sentiment in some parts of the country that single states or regions, including parts of several states, should be permitted to set clocks an hour ahead of war time during the summer months. Director Eastman of the Office of Defense Transportation has come out strongly against such action, either for scattered communities within a state, or an entire state. Unless observed on a wide basis, says Mr. Eastman, "it would create growing demands for service, which would, to the extent that they could be met, absorb crews, coaches, locomotive power, in a time when it is essential that passenger service be maintained on a most economic and efficient basis if carriers are to meet demands for military movements and necessary traffic directly connected with the war."

Bottlenecks in Highway Transportation

Director Eastman of the Office of Defense Transportation is seriously concerned over the slowing down of the movement of vital military supplies on the highways. Because of the existing state restrictions he is urging federal legislation to eliminate these bottlenecks. "I am satisfied," said Mr. Eastman, "that there is actual, continuous and substantial interference with interstate movement of vital war materials and supplies in many states of the union. Complaints of such instances are made to this office almost every day, some of them disclosing quite serious situations. . . . I think it should be said that many of the states have made a sincere effort to be helpful in permitting the free flow of vital traffic by motor vehicle, notwithstanding existing state restrictions. In many others, however, there is no apparent disposition to depart from the peacetime policy of strict enforcement, or to remove existing hampering regulations in time of war."

Retirement Board Moving to Chicago

The Railroad Retirement Board was one of the bureaus which were crowded out of Washington because of the serious congestion in our Capitol under war conditions. The America Fore Building in Chicago was purchased and has been in the process of refitting to house the board with its various bureaus and voluminous service records. A special train of 22 cars of office furniture and equipment arrived in Chicago on April 6, and the Bureau of Wage and Service Records started to get settled in its new quarters. Other bureaus of the board are being moved as rapidly as the building can be remodeled for their use. Of the 1,700 persons employed by the board, it is estimated that about 1,000 will move to Chicago. Replacements will be made from civil service lists.

Transportation of Industrial Workers

The drastic reduction in the amount of rubber available for automobile tires promises to complicate seriously the problem of transporting workers in the essential war industries to and from their homes. Many of these industries are located outside of the population centers and because of lack of housing in the immediate vicinity of the plants, workers must travel long distances. The problem of the Houston (Texas) Shipbuilding Company is being solved with the aid of the United States Maritime Commission, which has made special arrangements with the Public Belt Line Terminal and affiliated railroads. The necessary passenger equipment is being provided by the purchase of 42 coaches formerly owned by the New York, Westchester & Boston.

Tank Car Records Climb

For many weeks the tank car movement to the East Coast has been climbing steadily upward and establishing new records. The latest information at the time this was written was for the week ending April 11, during which a total of 586,350 barrels were moved daily. To make this movement the twenty oil companies reporting loaded a total of 18,243 cars. This must indeed be a source of satisfaction to the A. A. R. and its members, who were rather roundly scolded by Petroleum Coordinator Harold L. Ickes several months ago, when he questioned the ability of the railroads to utilize the tank cars to any great advantage in transporting oil to the East Coast.

Among the Clubs and Associations

Alternate Journal-Bearing Design License

THE modified design of standard journal bearing, developed by the A. A. R. Mechanical division to conserve copper and tin and described in the February *Railway Mechanical Engineer*, page 73, included an alternate design with depressed back which is covered by U. S. patent No. 2154916 issued to the Railway Service & Supply Corp., Indianapolis, Ind. In a letter dated April 10, V. R. Hawthorne, executive vice-chairman of the Mechanical division, states that the owner of this patent has agreed to license it to manufacturers of journal bearings so that railroads may use this patented feature on freight-car journal bearings for the duration of the war to conserve the critical materials, copper and tin.

A license form, approved by the A. A. R. law department, has been prepared and may be executed by a bearing manufacturer or any railroad which makes and uses its own freight-car journal bearings. It will not be necessary for a railroad or car owner which buys all of its bearings from a licensed manufacturer to execute this agreement. The nominal royalty requested for the use of this patent during the war period is $1 per year.

Conservation of Tin

IN an A. A. R. Mechanical Division letter, dated April 11, attention is called to the importance of doing everything possible to restrict the use of tin to absolute necessities. In the interest of tin conservation, every railroad is requested to give fair trial to such substitutes as have been developed and offered for use. In this connection, the letter states that the North American Smelting Company, Philadelphia, Pa., has developed a tin-free solder known as North American Victory Solder, the possibilities of which should be fully developed.

In addition, the Federated Metals Division of the American Smelting & Refining Company has developed "G" babbitt metal which contains little or no tin. (One large railroad reports testing one of these babbitts with about 1 per cent tin with satisfactory results.)

The Magnus Metal Corporation advises that it is in position to supply "Satco" metal (which contains 1 per cent tin) for use as a babbitt metal. This information is transmitted with the suggestion that these companies be contacted for information as to materials which may facilitate materially restricting the use of tin by railroads.

Standard Cars Approved by Letter Ballot

As instructed by the Board of Directors of the Association of American Railroads, the Mechanical division Committee on Car Construction, in cooperation with the American Railway Car Institute, has developed designs covering standard A. A. R. box and automobile-box cars having inside dimensions of length, 50 ft. 6 in.; width, 9 ft. 2 in.; height at eaves, 10 ft. 6 in. These are steel-sheathed, wood-lined cars, the box car having alternate arrangements for clear side door openings of 6 ft., 7 ft., and 8 ft., respectively. The automobile-box car has a 15-ft. clear side door opening, with alternate arrangement for an end door. These box-car designs were submitted to letter ballot in a circular dated February 24, 1942, and, as a result of a strongly favorable vote, have been approved by the association for inclusion in a supplement to the Manual of Standard Practice of the Mechanical division.

Proceedings Coordinated Mechanical Associations

THE proceedings containing the reports and addresses presented at the meetings of the four Coordinated Mechanical Associations held at Chicago, September 23-24, 1941, have been published as follows:

Master Boiler Makers' Association.—A. F. Stiglmeier, secretary-treasurer, 29 Parkwood street, Albany, N. Y. 214 pages. Price, $5.

Car Department Officers' Association.—Secretary-treasurer, F. L. Kartheiser, chief clerk-mechanical, Chicago, Burlington & Quincy, Chicago. 202 pages. Price, $2.

The Railway Fuel and Traveling Engineers' Association.—T. Duff Smith, secretary-treasurer, 327 South La Salle street, Chicago. 336 pages. Price, $3.

Locomotive Maintenance Officers' Association.—C. M. Lipscomb, secretary-treasurer, care of Missouri Pacific Shops, No. Little Rock, Ark. 196-pages, spiral bound. Price, $3.

F. E. Cheshire Pays Tribute to Supply Companies

CAR FOREMEN'S ASSOCIATION OF CHICAGO.—Meeting held March 9. Speaker: F. E. Cheshire, assistant superintendent car department, Missouri Pacific. Subject: The Modern Freight Car. ¶Mr. Cheshire traced the development of freight cars from the earliest types to efficient modern units and emphasized the vital part which railway car men have played in perfecting design details, improving maintenance practices and securing increased utilization of freight car equipment. Regarding the contribution of railway equipment and supply companies to this important work, Mr. Cheshire said: ¶"Contributing the engineering genius and service assistance of their organizations, the supply companies have marched side by side, through good times and bad, with the builders and operators of freight cars. They have produced new materials, new devices and improvement in existing appliances. The modern draft gear, the coupler, the air brake, doors and fixtures, the modern car wheel, improved trucks, the metal running board, cars with loading devices to simplify and expedite loading, stowing and unloading; and numerous other integral parts of the American freight car stand as monuments to railway supply companies and their contribution to the modern freight car."

A. S. M. E. Railroad Division Studies Material Needs

THREE phases of the vital material problem which confronts the railways, namely, conservation, substitution and reclamation, will be analyzed and discussed at the railroad sessions of the semi-annual meeting of the American Society of Mechanical Engineers which are scheduled to be held Wednesday, June 10, 1942, at the Hotel Statler, Cleveland, Ohio. This meeting is part of the general three-day program of the society which will be held June 8-10, inclusive, and follows the semi-annual dinner on the evening of Tuesday, June 9.

Details of the program sponsored by the Railroad Division of the Society are given below.

It is anticipated that about 300 mechanical engineers and executives representing both the railroads and railway supply companies will be present at this meeting and participate in the discussion which is designed to throw additional light on the important material problems now confronting the railways.

MORNING SESSION

Opening remarks by Joseph B. Eastman, director, Office Defense Transportation, Washington, D. C.
Paper on Conservation, by A. G. Hoppe, assistant mechanical engineer, Chicago, Milwaukee, St. Paul & Pacific.
Paper on Substitution, by C. B. Bryant, engineer of tests, Southern.

AFTERNOON SESSION

Remarks by Andrew Stevenson, chief, Transportation and Farm Equipment Branch, War Production Board, Washington, D. C.
Paper on Reclamation, by G. A. Goerner, general storekeeper, Chicago, Burlington & Quincy.
General discussion on all papers at the conclusion of Mr. Goerner's presentation.

NEWS

WPB Transportation Branch Appointments

THE appointment of Sidney L. Miller as assistant chief of the War Production Board's Transportation Branch has been announced by Andrew Stevenson, branch chief. Mr. Miller was formerly executive head of the Bureau of Business Research at the University of Iowa, and from 1916 to 1925 he was instructor of economics and transportation at the University of Wisconsin.

Mr. Stevenson also announced the following additional appointments:

David W. Odiorne, chief of the Rolling Stock Section. Mr. Odiorne has been connected with the New York Central as special inspector and supervisor of service tests for materials and appliances on locomotives and cars.

E. Carroll Hanly, chief of the Motive Power Section. Mr. Hanly formerly was with the Pennsylvania as foreman in charge of building and repair of rolling stock and locomotives.

ODT Appointments

CHARLES T. RIPLEY, chief engineer, Technical Board of the Wrought Steel Wheel Industry, has been named a consultant on Diesel engine propulsion equipment in the Section of Materials and Equipment, Office of Defense Transportation. Mr. Ripley took over that assignment in addition to his present job as consultant on steam, Diesel and electric locomotives, when the original appointee—H. L. Hamilton, manager of the Electro-Motive Division of the General Motors Corporation—was unable to accept the position.

E. R. HAUER, engineer of motive power, Mechanical Advisory Committee, Chesapeake & Ohio, Erie, New York, Chicago & St. Louis, and Pere Marquette, has been appointed an assistant director of the Office of Defense Transportation's Division of Railway Transport. Mr. Hauer will be "in charge of mechanical operations," working "to increase further the efficiency of the nation's railway equipment," according to the ODT announcement.

W. P. B. Risks Fall Transportation Shortage

ON April 8 the War Production Board announced that materials would be allocated during the remainder of 1942 for the production of 18,000 freight cars and 300 locomotives, in addition to the 45,000 cars and 926 locomotives contemplated in the schedules running to May 1 which were approved on January 2 by the former Supply Priorities and Allocations Board. No assistance will be given for additional passenger car construction, but "materials will be made available to complete Army and lend-lease orders" for railroad rolling stock.

Limitation orders on April 4 froze all unfinished cars and locomotives in the hands of producers. At that time, the locomotive program authorized by SPAB was "ahead of schedule"; but deliveries under the freight-car program were delayed—19,000 cars remaining to be delivered by May 1. These 19,000 cars and the 18,000 others now authorized, along with locomotives hereafter produced, will now be rationed among using railroads by the WPB's Transportation Branch, "acting upon recommendations of the Office of Defense Transportation."

(According to figures compiled by the Railway Age, the number of freight cars delivered during the first three months of 1942 totaled 21,619. The backlog of unfilled orders on March 31 totaled 47,297. Orders of locomotives for domestic service during the first three months totaled 202 steam, 131 Diesel-electric, and five electric locomotives. Of the 131 Diesel-electric locomotives, 123 are for railroad service and include 21 of 5,400 hp.; 5 of 4,050 hp., and 2 of 4,000 hp.)

The WPB control of production and deliveries will be operated under General Limitation Order L-97 which applies to locomotives, and General Limitation Order L-97-a which applies to freight and passenger cars. Both set forth that "the fulfillment of requirements for the defense of the United Sates" has created a shortage in the supply of railroad equipment; and "it now becomes necessary in the public interest and to promote the national defense to provide for the orderly scheduling of production and delivery" of such equipment. The restrictions on production and delivery of equipment apply "irrespective of the terms of any contract of sale or purchase or of any other equipment;" while the production and delivery schedules to be established by WPB "shall be maintained without regard to any preference ratings already assigned or hereafter assigned to particular contracts . . . and without regard to production schedules in effect on the effective date of this order. . . "

In fixing the production schedules WPB will be interested in as much concentration as is practicable in order that some plants now building railroad equipment may be released for the production of war materials.

In assuring the Industry Committee that materials will continue to be made available to complete the SPAB program, Andrew Stevenson, chief of the Transportation Branch, WPB, said that "inventories now held by the entire industry will have to be used for this purpose, and pooling of materials may be necessary." As to the locomotive phase of the new program, he said that the 300 additional engines now authorized will include 250 steam locomotives and 50 Diesel-electrics. Construction of the latter, however "must not interefere with output of Diesel engine crankshafts for military use."

In discussing the effect of the WPB action on their equipment programs, railroad

(Continued on next left-hand page)

Orders and Inquiries for New Equipment Placed Since the Closing of the April Issue

LOCOMOTIVE ORDERS

Road	No. of Locos.	Type of Locos.	Builder
Alabama, Tennessee & Northern	1	80-ton Diesel-elec.	General Electric Co.
Bessemer & Lake Erie	5	2-10-4	Baldwin Loco. Wks.
	2	0-8-0	American Loco. Co.
Duluth, Missabe & Iron Range	10	2-8-8-4	Baldwin Loco. Wks.
Laurinburg & Southern	1	44-ton Diesel-elec.	General Electric Co.
Patapsco & Back Rivers	2	1,000-hp. Diesel-elec.	Electro-Motive Corp.
	2	600-hp. Diesel-elec.	
Philadelphia, Bethlehem & New England	2	1,000-hp. Diesel-elec.	Electro-Motive Corp.
	2	600-hp. Diesel-elec.	
Southern	1	4,000-hp. Diesel-elec.	American Loco. Co.
	1	4,000-hp. Diesel-elec.	Electro-Motive Corp.

LOCOMOTIVE INQUIRIES

Baltimore & Ohio	25	1,000-hp. Diesel-elec.	.....
Western Pacific	6	4-8-4	.....

FREIGHT-CAR ORDERS

Road	No. of Cars	Type of Car	Builder
Baltimore & Ohio	25	50-ton hopper	Bethlehem Steel Co.
Canadian Pacific	500	40-ton box	Canadian Car & Fdry. Co.
	200	50-ton box	National Steel Car Co.
	150	70-ton ore	
	50	50-ton box	Eastern Car Co.
Duluth, Missabe & Iron Range	500	75-ton ore	American Car & Fdry. Co.
	500	75-ton ore	Gen. Amer. Transp. Corp.
	500	75-ton ore	Pull.-Std. Car & Mfg. Co.
	500	75-ton ore	Pressed Steel Car Co.
National Rwys. of Mexico	500	50-ton box	American Car & Fdry. Co.
Pittsburg & Shawmut	..[1]	50-ton hopper	Pressed Steel Car Co.

FREIGHT-CAR INQUIRIES

Bethlehem Steel Co.	12	100-ton flat	.....
Seaboard Air Line	500	50-ton box	.....

[1] For August delivery.

Note: In the April issue, the Union Pacific was reported to have ordered 1,000 50-ton gondolas from the Pullman-Standard Car Manufacturing Company. This order has been suspended awaiting action by the War Production Board.

NO Critically Strategic Metals are Needed TO MAKE CHILLED CAR WHEELS

No stock piles are called on for scarce metals to help make Chilled Wheels.

Only iron is required and much of that is used over and over as the Wheels retired from service are returned to our foundries under the unique exchange plan.

Where a shortage of used wheels exists, the industry is dependent upon pig iron, but under the officially approved plan of the W.P.B., manufacturers are able to continue to make the vitally necessary wheels for railroad service.

Chilled Car Wheels not only save money, but today they save priceless metals for use where they are indispensable in winning the war.

ASSOCIATION OF MANUFACTURERS OF CHILLED CAR WHEELS

230 PARK AVENUE,
NEW YORK, N. Y.

445 N. SACRAMENTO BLVD.,
CHICAGO, ILL.

AMCCW

ORGANIZED TO ACHIEVE:
Uniform Specifications
Uniform Inspection
Uniform Product

men are inclined to build up their twelve-months figures on an October-to-October basis. The program running from October 1, 1941, until October 1, 1942, which was developed during the latter part of last year, contemplated the acquisition of 113,594 freight cars. Under that program 24,793 cars were installed in service during October, November and December, 1941. Assuming that the 62,143 cars to be made available in 1942 will be delivered by next October, the October-to-October total becomes 86,936 cars or 26,658 fewer than the 113,594 which the carriers hoped to get.

As to the types of cars which will be built, the Transportation Branch has been receiving recommendations from the Office of Defense Transportation, while ODT in turn has consulted with the Association of American Railroads. The first tentative breakdown of the WPB's 18,000 was: 5,750 hopper cars; 5,750 gondola cars; 2,500 flat cars; and 4,000 tank cars. Later revisions, however, may bring changes in order to work in some box cars. Also, a small number of cabooses or special-type cars may be permitted. If so the number of tank cars will be reduced accordingly.

Standardization of Car Repairs Advocated — A Correction

THE omission of the word "not" in the paragraph on the Standardization of Car Repairs Advocated on page 154 of the April issue of the *Railway Mechanical Engineer* changes the meaning of a statement made therein. The first two sentences should have read: "The standardization of both passenger and freight equipment is largely responsible for railroads of the United States weathering the last depression as well as they did. However, the policy of standardization has *not* gone far enough."

Unfortunately, the author's name was also incorrectly spelled. A. D. Alford, general car foreman of the Illinois Central at New Orleans, La., submitted this thought as well as that on the pooling of passenger equipment on the same page in the competition on ways and means of improving mechanical department operations to meet the war emergency.

P. R. R. Crew Drives in for Repairs at "Service Station"

THE engine crew of a westbound passenger train on the Pennsylvania between Pittsburgh, Pa., and Chicago recently stopped for repairs at a factory along the line, thereby cutting what might have been a long delay to a minimum, and preventing a partial tie-up of traffic on an extremely busy piece of railroad. Engineman John Lorne and Fireman H. H. McMurray, at the head end of Train No. 113, felt the air brakes apply automatically about three miles west of Beaver Falls, Pa. They found that the pipe feeding steam to the air compressor on the locomotive was disconnected, causing the compressor to be inoperative.

It was impossible to move the train unless the pipe was replaced. A quick examination showed that if a new thread were cut on the pipe it could be recoupled with ease. Across the tracks a sign proclaimed that the Babcock & Wilcox Company manufactured steam boilers on the premises. Surely the best place in the world to find a pipe-fitting tool. Accordingly the engineman, disconnecting the pipe, took it over to B. & W., selected pipe stock and die of the right size and, with the assistance of a plant employee, cut a new thread thereon. Returning to the locomotive he and the fireman together replaced the pipe and made the proper coupling. The brakes were promptly released and Train No. 113 proceeded on its way—after a detention of only 35 min.

Pendulum Cars Tested

APPROXIMATELY 150 railway officers and members of the Chicago Association of Commerce participated in a test run of the three new pendulum cars, owned by the Atchison, Topeka & Santa Fe; the Chicago, Burlington & Quincy and the Great Northern, respectively, on April 13. These cars were assembled, with two streamlined coaches of latest designs, into a train which was operated from Chicago to Galesburg, Ill., by the Burlington and returned over the Santa Fe. The test was a high-speed run throughout, approximating 85 m. p. h. cruising speed and reaching a maximum of 105 m. p. h.

WPB Estimates Too Low — Eastman

DIRECTOR Joseph B. Eastman of the ODT, speaking before the Atlantic States Shippers' Advisory Board in Philadelphia on April 9, made it quite clear that he disagreed profoundly with the allotment which the WPB has made for railroad equipment construction during the balance of the current year.

Nothing enters into this war, he explained, in which transportation is not an ingredient—"not merely indispensable, but all-pervasive. Why," he then observed, "in the organization of WPB, transportation should be classed along with civilian supply, I am unable to understand."

It is easy to regard transportation as a function of minor importance so long as everything goes smoothly, he said, but just wait till there is a *hitch* somewhere, as there was recently in the port of Philadelphia. Then people begin to see how vital transportation really is to everything we must do in fighting this war.

Director Eastman indicated that he was not going to accept the WPB's meager estimate of the country's needs for transport materials. He is going to continue to insist that the WPB quotas be raised, and he hopes there will be "modifications." "Conversations will continue," he added.

Complimenting the railroads and shippers in terms of highest praise for efficiency of railroad performance which they have co-operatively achieved, the speaker declared that still more strenuous efforts would be needed. He cited the increase in tank-car movement of petroleum products to the Atlantic seaboard from 70,000 bbl. daily last fall to more than 500,000 bbl. daily now; and also the withdrawal of coastwise and intercoastal ships, throwing long hauls on the railroads.

The country is rapidly accelerating to production levels heretofore unheard of at any time or place—and this alone would put a strain on the rail carriers, even if they did not have diverted traffic from other agencies of transportation to concern them. The speaker drew attention also to great shifts in the direction of traffic (westward in the Pacific Coast area, for example, instead of predominantly eastward, as always heretofore).

Railroads and the New Manpower Commission

THOSE activities of the Office of Defense Transportation which relate to labor supply requirements and those of the Railroad Retirement Board with respect to employment service will be brought under the jurisdiction of the new War Manpower Commission headed by Paul V. McNutt, Federal Security Administrator, as a result of an executive order issued on April 18 by President Roosevelt. The aforementioned are listed among the agencies which "shall conform to such policies, directives, regulations and standards as the chairman may prescribe in the execution of the powers vested in him by this order, and shall be subject to such other coordination by the chairman as may be necessary to enable the chairman to discharge the responsibilities placed upon him."

The activities of the Railroad Retirement Board have dealt mainly with recruiting replacements for the carriers, while the ODT has been working on the subject of the manpower needs of the railroads in relation to the operation of Selective Service.

All Efficiency Records Shattered in 1941, Says Pelley

"AMERICAN railroads shattered all previous efficiency records and set up new ones in moving the unprecedented freight traffic of the country in 1941," according to complete reports for that year, J. J. Pelley, president of the Association of American Railroads, announced recently. As reported by Mr. Pelley, the outstanding operating performance of the railroads in 1941 follows:

"Outstanding in railroad performance was the increase in the amount of freight that was carried per train, that average in 1941 having been 915 tons, or an increase of 41 per cent compared with 1921. In 1940 the average was 849 tons and in 1929, the year of heaviest traffic in the history of the railroads, it was 804 tons.

"Freight-train performance in 1941 was approximately twice that of twenty years ago. That is, gross ton-miles per train hour increased from 16,555 in 1921 to 34,684 in 1941, or 109.5 per cent, while net ton-miles per freight train hour increased from 7,506 in 1921 to 14,938 in 1941, or 99 per cent. These are new high records in both instances.

"Freight locomotives in 1941 operated a daily average of 116.4 miles, which also was a new high record. The average daily

(*Continued on next left-hand page*)

"The Freight Train provides the circulation that means Life To The Nation"

C & O 2-6-6-6 "Allegheny Type" locomotive built by Lima Locomotive Works, Inc.

Now, more than ever, the continuous hauling of heavier freight at higher speeds is of vital importance to the preservation of our American way of life.

The railroads of America have brought the handling of freight to a point of unprecedented efficiency. Over the past two decades average freight-train speed has increased 45 per cent, freight-car capacity has increased from 42 tons to 50, and a day's freight-train run has been almost doubled.

Modern Lima Super-Power Steam Locomotives, as exemplified in the new C & O 2-6-6-6 "Allegheny Type" locomotives now in service, have an important part in this achievement. Because of their greater drawbar horsepower and faster speeds they are helping America to "keep 'em rolling".

LIMA LOCOMOTIVE WORKS, INCORPORATED, LIMA, OHIO

LIMA LOCOMOTIVE WORKS INCORPORATED

movement of all freight cars, which includes time of cars being loaded and unloaded, was 42.6 miles in 1941, a new high record, and an increase of 65 per cent compared with 1921. Net ton-miles per freight car per day was 795 ton-miles, also a new record. The previous record was established in 1940, with an average of 664 ton-miles per day.

"Fuel efficiency in freight service was never better than in 1941. Despite the increased weight per train and the increase that has taken place in the average speed of trains, the railroads in 1941 averaged 111 lb. of fuel for the movement one mile of 1,000 tons of freight and equipment. This average has never before been attained. For each pound of fuel used in freight service in 1941, the railroads hauled nine tons of freight and equipment one mile compared with 6⅛ tons in 1921, or an increase of 46.3 per cent.

"Railroads on January 1, 1941, had 108,972 freight cars in need of repair or 6.8 per cent of ownership. On January 1, 1942, there were 62,200 or 3.7 per cent, which up to that time was the smallest number on record. Since then, this number has been further reduced with the result that on February 1, 1942, there were 60,869 or 3.6 per cent, which is a new low record."

Alco's War Production Well Ahead of Schedule

In a brief ceremony on April 20 held on the site where, one year ago, the American Locomotive Company delivered the first medium tank built by private industry, Duncan W. Fraser, president, told 7,000 employees that the company's current tank production was far ahead of its contract requirements. Observance of the anniversary, held during the noon hour at the plant, which is on a 24-hour production schedule, included the presentation of one-year service stripes to employees who aided in solving the early problems in tank production.

Explaining that the company's participation in war production is not limited to tanks but includes also gun carriages, fragmentation bombs, Diesel engines for the Navy, shells and various other items in addition to locomotives, Mr. Fraser reported that production of these items was also ahead of schedule.

Equipment Purchasing and Modernization Program

Atlantic & North Carolina.—The A. & N. C. has asked the Interstate Commerce Commission to approve a loan to it by the State of North Carolina in the amount of $45,000, the proceeds to be used to purchase four additional locomotives. The note will be retired in five equal annual installments of $9,000, the first to be payable one year after the date of the note, and one installment each year thereafter.

Chicago & North Western.—A $46,000,000 program, devoted primarily to the maintenance of the railroad plant for the war effort, will be undertaken by the Chicago & North Western in 1942. Of this total, approximately $17,600,000 will go for the maintenance and improvement of existing equipment and $10,275,000 for the purchase of new freight equipment. Included in the purchases are 3,375 freight cars and 20 Diesel-switching locomotives, orders for which were placed last year. In addition, existing freight equipment not in use will be remodeled to provide additional units.

Special emphasis is being placed on motive power this year to increase utilization and availability. Fifty stokers are being installed in two classes of steam locomotives, power reverse gears in more than 100 locomotives and integral cast-steel cylinders to replace cast-iron cylinders on eleven steam power units. In addition, other major mechanical improvements to motive power are being made.

Chicago, Milwaukee, St. Paul & Pacific.—Division 4 of the Interstate Commerce Commission has modified its certificate and order in Finance Docket No. 13216 so as to show that the Milwaukee will purchase six coaches instead of the six parlor cars already authorized. The supplemental application explained that the company has been unable to get priorities on the materials for the parlor cars but feels that it can get them on the coaches. It also declared that the cost of the coaches will be approximately the same as that of the parlor cars, or about $240,000. The original amount of the equipment trust which was authorized early last year was $3,120,000.

The Elgin, Joliet & Eastern.—The E. J. & E. is reported to be considering the acquisition of new freight cars.

Great Northern.—Directors of the Great Northern have authorized the expenditure of $3,500,000 for the purchase of 1,000 ore cars of 75-tons capacity.

International-Great Northern.—The trustee of the Missouri Pacific has asked the commission for authority to permit the International-Great Northern to assume liability for $630,000 of equipment trust certificates, maturing in 10 equal annual installments of $63,000 on April 15 in each of the years from 1943 to 1952, inclusive. The proceeds will be used as a part of the purchase price of new equipment costing a total of $1,062,886 and consisting of 100 50-ton, 40 ft. 6 in. all-steel box cars; 200 50-ton, 45 ft. all-steel low side flat bottom gondola cars; and 50 50-ton, 50 ft. all-steel flat cars.

The Lehigh & New England.—The L. & N. E. was erroneously reported to be considering the purchase of new freight cars in the April, *Railway Mechanical Engineer*.

Missouri-Illinois.—The trustee of the Missouri Pacific has asked the commission for authority to permit the Missouri-Illinois to assume liability for $390,000 of equipment trust certificates, maturing in five equal annual installments of $78,000 on April 15 in each of the years from 1943 to 1947, inclusive. The proceeds will be used as a part of the purchase price of new equipment costing a total of $657,406 and consisting of 100 50-ton, 40 ft. 6 in. all-steel box cars; 50 50-ton, 29 ft. 3 in. all-steel covered hopper cars; and 50 50-ton, 45 ft. all-steel low side flat bottom gondola cars.

Missouri Pacific.—This company has asked the Interstate Commerce Commission for authority to assume liability for $2,240,000 of equipment trust certificates maturing in 10 equal annual installments of $224,000 on April 15 in each of the years from 1943 to 1952, inclusive. The proceeds will be used as part of the purchase price of new equipment costing a total of $3,749,844 and consisting of 750 50-ton, 40 ft. 6 in. all-steel box cars; 200 50-ton, 50 ft. 6 in. all-steel box cars; 50 50-ton, 50 ft. 6 in. all-steel box cars, equipped with high-speed trucks for passenger service; 50 70-ton, 65 ft. all-steel mill type gondola cars; and 50 50-ton, 50 ft. all-steel flat cars.

St. Louis, Brownsville & Mexico.—The trustee of the Missouri Pacific has asked the commission for authority to permit the St. Louis, Brownsville & Mexico to assume liability for $1,290,000 of equipment trust certificates maturing in 10 equal annual installments of $129,000 on April 15 in each of the years from 1943 to 1952, inclusive. The proceeds will be used as a part of the purchase price of new equipment costing a total of $2,150,551 and consisting of 250 50-ton, 40 ft. 6 in. all-steel box cars; 400 50-ton, 45 ft. steel low side flat bottom gondola cars; and 50 50-ton, 50 ft. all-steel flat cars.

Southern Pacific.—Among the 1942 improvements being made by the Southern Pacific are a four-stall addition to the enginehouse at Eugene, Ore., the erection of a blacksmith and tinsmith shop at Brooklyn, Ore. The latter is of framed timber construction, 80 ft. by 120 ft., covered with galvanized corrugated metal, replacing outmoded smaller buildings used for like purposes.

G.E. Develops Films for Training Welders

The first attempt to use motion pictures as an aid in the training of arc-welding operators has been announced by the General Electric Company, Schenectady, N. Y. A series of six films is planned; the first has been completed and is available to interested organizations; others will be released as soon as they have been completed. The film which is now ready for distribution covers the fundamentals of good welding practice, including the factors of current setting, angle of electrode, arc length and speed of travel. The reel is made in color and is partly animated to bring out clearly the more important points involved.

12,787 Air-Conditioned Cars

Class I railroads and the Pullman Company had 12,787 air-conditioned passenger cars in operation on January 1, according to the Association of American Railroads. This was an increase of 587 compared with the number of air-conditioned passenger cars on January 1, 1941, at which time there were 12,200 passenger cars so equipped.

Of the total number of such cars, Class I roads on January 1, had 7,523 an increase of 562 compared with the same date last year. The Pullman Company had 5,264 air-conditioned passenger cars in operation, or an increase of 25 compared with January 1, 1941.

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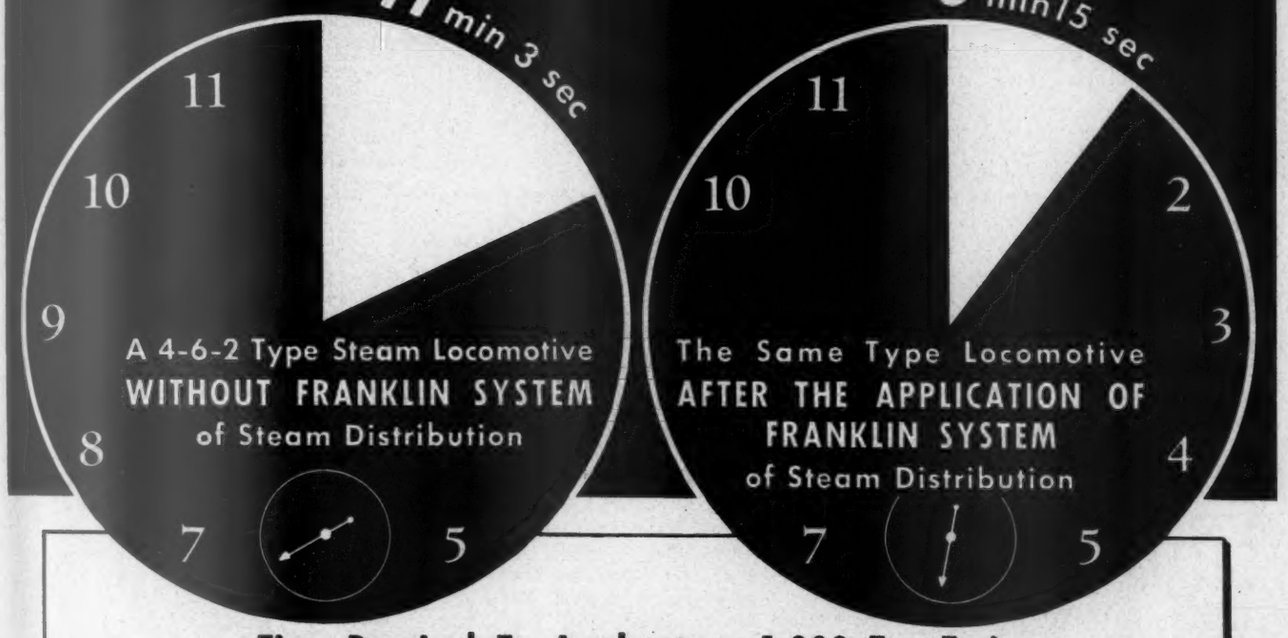
BACK TO ROAD SPEED IN HALF THE TIME



Time Required To Accelerate a 1,000 Ton Train From 40 mph To 75 mph on Tangent Level Track

The time required to get back to road speed after slow downs is dependent upon the power available for acceleration. The increased horsepower resulting from the Franklin System of Steam Distribution gives a higher margin of power to accelerate rapidly. It does this by releasing the latent power that has heretofore been unavailable due to the limitations of the piston valve. This greater power at higher speeds keeps trains on schedule.

FRANKLIN RAILWAY SUPPLY COMPANY, INC. NEW YORK CHICAGO

In Canada: FRANKLIN RAILWAY SUPPLY COMPANY, LIMITED, MONTREAL

Supply Trade Notes

HYNES SPARKS has been appointed vice-president in charge of railway sales of the Symington-Gould Corporation. He was formerly manager of eastern sales of Symington-Gould.

◆

HOWARD W. BROECKER has been appointed assistant district manager in the Chicago district selling Aristoloy alloy and Coppco tool steels for the Copperweld Steel Company. Mr. Broecker was previously associated in the Chicago district with the Youngstown Sheet & Tube Company, and with the Interstate Iron & Steel Company.

◆

O. C. DURYEA CORPORATION.—*Charles E. Miller* has been elected vice-president of the O. C. Duryea Corporation, with headquarters at Chicago. *James A. Farquharson*, district representative with headquarters at Washington, D. C., has also been appointed a vice-president.

◆

BULLARD COMPANY.—*Edward Payson Bullard, III*, has been elected vice-president in charge of manufacturing of the Bullard Company, makers of machine tools at Bridgeport, Conn. *John A. Bullard*, son

Edward Payson Bullard, III

of the late A. H. Bullard, who was treasurer of the company, and *J. W. C. Bullard, Jr.*, whose father is vice-president in charge of research, have been elected to the board of directors.

E. P. Bullard, III, whose father is president of the firm, was graduated from Yale University in 1932 and attended the Harvard School of Business Administration. He is the designer of the Bullard cut master vertical turret lathe. He developed a descaling machine for the Bullard-Dunn metal-cleaning process, and has developed and designed many tools for the company and its customers.

John A. Bullard, sales engineer for the company, is a graduate of Swarthmore College. At first associated with the Carpenter Steel Company at Reading, Pa., and the Billings & Spencer Co. at Hartford, Conn., he has been with the Bullard Company for 11 years.

J. W. C. Bullard, Jr., who graduated from Lehigh University, is on the staff of the purchasing department.

◆

E. A. PRESTON has been appointed mechanical engineer of the Wilson Engineering Corporation, Chicago, succeeding J. M. Lammedee, deceased. Mr. Preston received a high-school education. He served a machinist apprenticeship with the Hess Heating & Ventilating Co., and later entered the engineering and drafting department of the Stegeman Motor Car Com-

E. A. Preston

pany, and subsequently was connected with the Fabricated Ship Company in design and construction of deck machinery and steam auxiliaries. Following Naval enlistment for the duration of World War I, Mr. Preston was employed at Newport News Navy Yard and the Bailey Blowers Company until August, 1924, when he became mechanical engineer for the D. J. Murray Manufacturing Company, engaged in the design and construction of gas washers for steel mills, special machinery for paper mills, and unit heaters for railroad engine terminal and shop service.

Navy "E" Awards

THE Navy "E" pennant was awarded to the *Ardco Manufacturing Company* in North Bergen, N. J., on March 26; to the *Electric Storage Battery Company* in Philadelphia, Pa., on March 28; to the *American Car and Foundry Company's* Wilmington, Del., plant on April 2; to the New Bedford Division of *Revere Copper and Brass Incorporated* on April 20, and to the *Carnegie-Illinois Steel Corporation* on April 23. This coveted emblem, in the form of a blue flag upon which appears a navy anchor and the letter "E," is awarded by the United States Navy for production achievement. Employees of all companies receiving this award are also given the right to wear the All-Navy "E" insignia as evidence of their accomplishment in production.

AMERICAN STEEL FOUNDRIES.—W. H. Baselt, chief mechanical engineer of the American Steel Foundries, has been appointed mechanical assistant to the vice-president and has been succeeded by *R. B. Cottrell*, assistant chief mechanical engineer, who in turn has been succeeded by *R. G. Aurien*, mechanical engineer of brakes.

◆

ALEXANDER M. HAMILTON has been elected executive vice-president in executive control of the Canadian Tank Arsenal, operated by the Montreal Locomotive Works, Ltd., an affiliate of the American Locomotive Company. He will devote his entire time to the production of combat tanks, working in co-operation with B. D. Beamish, director general of the tank production branch of the department of munitions and supply of the Canadian government.

◆

ASHTON VALVE COMPANY.—*Joseph W. Motherwell*, formerly vice-president, treasurer and general manager, has been elected president of the Ashton Valve Company. Mr. Motherwell will continue to hold the office of treasurer. *Henry B. Nickerson*,

Joseph W. Motherwell

vice-president, has been elected vice-president and general manager, to succeed Mr. Motherwell.

Mr. Motherwell began his career in 1888 as an apprentice with the Troy Laundry Machine Company, remaining as machinist and tool maker until 1890. He served as machinist and engine erector for the H. W. Caldwell Company from 1891 to 1893 and as erector, field engineer and railroad department salesman for Fairbanks, Morse & Co. from 1893 to 1904. He joined the Ashton Valve Company in 1904, serving as a salesman until 1911 and as a vice-president and manager of the railroad department from 1911 to 1921. In the latter year he was elected vice-president, treasurer and general manager.

Mr. Nickerson, during his earlier career, had been associated with the American Steam Gage Company from 1898 to 1923; with the American Schaeffer & Budenberg

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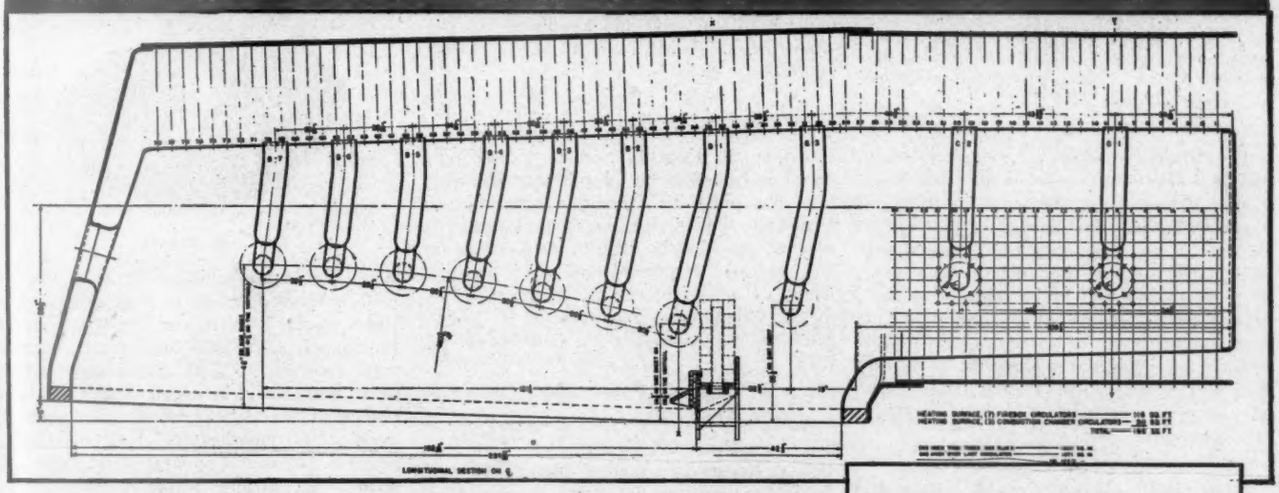
BETTER COMBUSTION
for modern freight locomotives through the application of
SECURITY CIRCULATORS



The problem of supporting brick arches of unusual length, which is the result of the demand for increased boiler horsepower, has been effectively solved by the Security Circulator, a development of the American Arch Company.

In addition to achieving the original object of improved support many other benefits have accrued. The reduction of honeycombing and cinder cutting lessens the maintenance of the boiler. The Security Circulator itself is extremely low in maintenance costs.

On the Security Circulators that have been installed during the last six years, performance has been thoroughly proved by over 10,000,000 locomotive miles of service.

Improved Arch Support for the largest fireboxes

★

Adapted to any type of locomotive

★

Reduced honeycombing, flue plugging and cinder cutting

★

Improved circulation in side water legs

AMERICAN ARCH CO., INC.

NEW YORK • CHICAGO **SECURITY CIRCULATOR DIVISION**

Corporation from 1923 to 1928; and with the Consolidated Ashcroft Hancock Company from 1928 to 1931. He joined the Ashton Valve Company as vice-president in charge of sales in 1931.

Henry B. Nickerson

◆

J. G. BRILL COMPANY.—*Leslie E. Hess* has been elected president of the J. G. Brill Company to succeed *Charles J. Hardy*, who has been appointed chairman of the board. Because of his other corporate connections, Mr. Hardy deemed it in the best interests of the company that he be relieved of certain of the duties imposed on him as president. The board of directors, therefore, created the office of chairman of the board and elected Mr. Hardy to that office. He will continue as chairman of the company's executive committee.

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J. H. WILLIAMS & Co.—*A. Donnally Armitage*, formerly vice-president, has been elected president of J. H. Williams & Co., to succeed J. Harvey Williams, deceased. *E. J. Wilcox*, formerly sales manager of the stock products division, has been elected vice-president in charge of stock products sales; *Willard C. Kress*, formerly works manager, has been elected vice-president in charge of all manufacturing; and *Hugh Aikman* and *Clark M. Fleming* re-elected to the positions of secretary and treasurer, respectively. Mr. Fleming will fill the vacancy in the company's board of directors caused by Mr. Williams' death.

JOSEPH T. WRIGHT has been appointed manager of the compressor and tool division of the Holyoke, Mass., plant of the Worthington Pump & Machinery Corporation.

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ALLEGHENY LUDLUM STEEL CORPORATION.—W. A. Givens, vice-president in charge of manufacturing at Pittsburgh, Pa., has been elected to the newly created position of executive vice-president and has been succeeded by Frank B. Lounsberry.

Obituary

FRED J. MAEURER, for the past 13 years associated as a specialist with the applied engineering department, Air Reduction Sales Company, died April 13. Mr. Maeurer was associated with the oxyacetylene industry for nearly 33 years, having joined the Davis-Bournonville Company, Jersey City, N. J., in 1909 and continued therein when that company was acquired by Airco in 1922.

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DAVID M. CRAIG, for many years an official of the Koppers Company, died suddenly in his office on March 26. He was 67 years old. Mr. Craig, a graduate of Princeton University, was employed for several years by the Pittsburgh & Western and was also associated with the Pennsylvania as an engineer for 15 years. He joined the Koppers organization as engineer in the construction department in 1915.

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GEORGE L. NORRIS, chief metallurgist of the Vanadium Corporation of America, died at Roosevelt Hospital, New York, on April 13. He was 76 years of age. Mr. Norris was one of the pioneers in the development and application of vanadium. He joined the American Vanadium Company in 1909 and remained with the company when it became the Vanadium Corporation of America.

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CARL A. W. BRANDT, chief engineer of The Superheater Company and a former railroad engineer, died on April 25. Mr. Brandt was born in Stockholm, Sweden, on January 28, 1881, and received a degree in mechanical engineering from the Technical College of Stockholm in 1899. He was assistant engineer and draftsman on the Government Railway of Sweden in 1900-01 and was associated with the Atlas Locomotive Works in Stockholm in 1902. He then came to the United States and in 1902 entered the employ of the Lake Shore & Michigan Southern (now the New York Central) as a machinist. In 1903 he became a draftsman for the same road at Cleveland, Ohio, and in 1905 was promoted to the position of assistant mechanical engineer at Cleveland. He was appointed mechanical engineer of the Cleveland, Cincinnati, Chicago & St. Louis in 1910. During 1914-15 he was assistant division master mechanic of the Big Four at Indianapolis. In 1916 Mr. Brandt became chief engineer of The Superheater Company, New York, in which capacity he had charge of the development and design of locomotive superheaters and feedwater heaters, and similar apparatus for stationary plants. Mr. Brandt was a member of the New York Railroad Club, the Canadian Railway Club, the Western Railway Club, the Railway Fuel and Traveling Engineers' Association, the Master Boiler Makers' Association, and the American Society of Mechanical Engineers. He was the author of "The Design and Proportion of Locomotive Boilers and Superheaters" presented before the Canadian Railway Club in 1928 and "The Locomotive Boiler" presented before the A.S.M.E. in 1939. For the latter, in 1941, he was awarded the A.S.M.E Melville Medal "for original engineering work."

C. A. Brandt

Personal Mention

General

P. B. CARRIER has been appointed supervisor of motor equipment on the Erie at Susquehanna, Pa.

F. S. TINDER, shop superintendent on the Virginian at Princeton, W. Va., has been appointed assistant superintendent of motive power, with headquarters at Princeton.

D. J. COON has been appointed mechanical supervisor of the New York, Chicago & St. Louis. Mr. Coon, whose headquarters will be at Cleveland, Ohio, will be in charge of locomotive operation and fuel supervision. Mr. Coon was formerly traveling engineer, Advisory Mechanical Committee.

W. J. TAPP, fuel supervisor of the Denver & Rio Grande Western at Denver, Colo., has been appointed to the newly created position of superintendent of fuel conservation at Denver.

I. R. PEASE, assistant to superintendent motive power on the New York, Ontario & Western at Middletown, N. Y., has been promoted to the position of assistant superintendent motive power with the same headquarters.

J. R. GROVE, master mechanic of the Washington Terminal Company, has become assistant superintendent of motive power on the Lehigh Valley at Bethlehem, Pa.

ARTHUR W. BYRON has been appointed superintendent of motive power of the Eastern Pennsylvania and the Central Pennsylvania divisions of the Pennsylvania, with headquarters at Harrisburg, Pa., as noted in the April issue. The position of superintendent of motive power of those divisions was formerly occupied by M. R. Reed, who was furloughed in 1938 to become a member of the Railroad Retirement

Board in Washington, D. C. Mr. Byron has been on leave of absence since June 1, 1941, when he became affiliated with the Office of Production Management (now the War Production Board). He was born in Buffalo, N. Y., on January 3, 1880, and after attending grammar and high schools in that city, completed an engineering course at the Y. M. C. A. evening school and a course in business training at the Buffalo College of Commerce. Prior to his entering the service of the Pennsylvania he worked for two and one-half years with the Lake Shore & Michigan Southern (now New York Central) as a machinist apprentice at Buffalo, where he was schooled in the air-brake department, erecting and machine shops, and the enginehouse. Mr. Byron entered the service of the Pennsylvania in December, 1899, as a draftsman in the office of the superintendent of motive power at Buffalo and advanced through various supervisory positions in that department to the position of superintendent of motive power of the Central Pennsylvania division at Williamsport, Pa. While he was master mechanic of the Philadelphia Terminal division from July 16, 1938, to October 16, 1939, he also had general supervision and jurisdiction over the motive power department of the Pennsylvania-Reading Seashore Lines. During

Arthur W. Byron

World War I, Mr. Byron was furloughed by the Pennsylvania from August 21, 1917, to December 13, 1920, for military duty, serving with the A. E. F. first as superintendent of motive power of Military Railways in the Zone of Advance and thereafter as assistant general superintendent of motive power, in charge of all railway mechanical activities, Zone of Advance. In 1920, he was assigned to duty with the U. S. Liquidation Commission and was honorably discharged from service in November, 1920, with the rank of Major.

EDWIN E. HINCHMAN, superintendent of the Los Angeles, Calif., general shops of the Southern Pacific who has been appointed assistant superintendent of motive power with headquarters at Sacramento, Calif., as noted in the April issue, was born at San Francisco, Calif., on February 17, 1894, and entered railway service on September 3, 1912, as a draftsman in the office of the general superintendent of motive power of the Southern Pacific at San Francisco. On May 1, 1926, he was appointed dynamometer engineer and on June 16, 1936, was appointed assistant master mechanic at Roseville, Calif., later being transferred to West Oakland, Calif. On April 1, 1939, Mr. Hinchman was promoted to master mechanic at Bakersfield, Calif., and on July 1, 1941, was advanced to superintendent of the Los Angeles general shops.

Master Mechanics and Road Foremen

J. A. LONG, JR., has been appointed master mechanic of the Washington Terminal Company.

J. G. DANNEBERG has been appointed master mechanic on the Atchison, Topeka & Santa Fe at Arkansas City, Kan.

J. W. ATKINSON, master mechanic on the Atchison, Topeka & Santa Fe at Arkansas City, Kan., has been transferred to Shopton (Ft. Madison), Iowa.

G. L. FISHER, master mechanic on the Erie, with headquarters at Buffalo, N. Y., has been transferred to Meadville, Pa., succeeding T. F. Gorman, deceased.

A. B. ATKINSON, general foreman on the Illinois Central at Centralia, Ill., has been appointed master mechanic, with headquarters at Memphis, Tenn.

J. A. TOBIN, master mechanic on the Union Pacific at Cheyenne, Wyo., has been appointed assistant master mechanic of the Wyoming division.

A. R. SNYDER, master mechanic of the Nebraska division on the Union Pacific at Council Bluffs, Iowa, has been transferred to Cheyenne, Wyo.

G. O. LOVE, general locomotive foreman on the Union Pacific, has been promoted to master mechanic of the Nebraska division, with headquarters at Council Bluffs, Iowa.

WALTER MEDLOCK, general foreman on the Denver & Rio Grande Western at Grand Junction, Colo., has been appointed master mechanic, with headquarters at Grand Junction.

F. W. KUBLER has been appointed master mechanic of the Los Angeles division of the Southern Pacific, with headquarters at Los Angeles, Calif., succeeding F. P. McDonald, deceased.

R. B. MCLEAN, master mechanic on the Denver & Rio Grande Western at Grand Junction, Colo., has been transferred to the Pueblo division, with headquarters at the Burnham shops, Denver, Colo.

C. K. JAMES, master mechanic of motor equipment on the Erie at Susquehanna, Pa., has been appointed master mechanic at Buffalo, N. Y. The position of master mechanic of motive equipment has been abolished.

L. R. HAASE, district boiler inspector of the Baltimore & Ohio, with headquarters at Baltimore, Md., has been appointed master mechanic of the Baltimore & Ohio Chicago Terminal, with headquarters at Chicago. Mr. Haase entered the service of the B. & O. as a messenger in 1919 and in 1920 became a machinist apprentice at the Mt. Clare shops. He subsequently became a machinist and in 1926 was appointed draftsman on locomotive, car and shop work, meanwhile having studied mechanical engineering at Polytechnic In-

L. R. Haase

stitute night school for six years. He later specialized in boiler design and construction. On November 1, 1935, he became district boiler inspector, Pennsylvania district, with headquarters at Pittsburgh, Pa., and in December, 1937, was transferred to Baltimore.

E. H. HOLLOWAY, mechanical assistant in the office of the superintendent motive power of the Central of Georgia, at Savannah, Ga., has been appointed supervisor of Diesel maintenance, reporting to T. A. Johnson, master mechanic at Macon, Ga.

Shop and Enginehouse

K. D. READ has been appointed assistant superintendent of the locomotive shops on the New York Central (Big Four) at Beech Grove, Ind.

WILLIAM H. FOSTER, master mechanic on the Virginian at Princeton, W. Va., has become shop superintendent with headquarters at Princeton.

L. B. GEORGE, division master mechanic on the Canadian Pacific at Lethbridge, Alta., has been appointed works manager of the Weston shops, Winnipeg, Man., succeeding John Lee, deceased.

W. P. GILFORD, enginehouse foreman on the Western Maryland at Keyser, W. Va., has been promoted to the position of general foreman at Port Covington, Baltimore, Md.

J. J. MEYERS, general locomotive foreman on the New York, Ontario & Western at Middletown, N. Y., has been appointed supervisor locomotive maintenance at Middletown.

G. W. BIRK, assistant superintendent of the locomotive shops on the New York Central (Big Four) at Beech Grove, Ind., has been appointed superintendent of those shops.

(*Turn to second left-hand page*)

50% REDUCTION
More Tonnage
Faster Schedules

WHO SERVES THE RAIL

Meeting the Challenge

AMERICAN railroads are today faced with the greatest transportation responsibility in our nation's history, that of moving the fast growing army of men, materials and supplies with safety and dispatch.

In meeting this challenge, General Motors Diesel locomotives in all classes of service are playing an important part, not only in promoting the conservation of vital war materials, such as metals and fuel, but many other operating advantages and economies. In this program the GM 5400 Hp. Diesel freight locomotives are particularly outstanding as evidenced by their ability to:

(a) Effect savings in train miles as much as 50 per cent, making one Diesel train mile the equivalent of two steam train miles.

(b) Release for other important service as many as five heavy steam locomotives for each Diesel locomotive operated.

(c) Increase the traffic hauling and time capacity; also availability for service.

(d) Provide faster schedules by eliminating many service delays now required for steam locomotives.

(e) Increase carrying capacity of existing track facilities without expensive rail replacements and rebuilding of bridge structures . . . this due to even weight distribution and low axle load of Diesels.

ELECTRO-MOTIVE
GENERAL MOTORS CORPORATION

...TION IN TRAIN MILES

...ILROADS – SERVES AMERICA

Conservation of War Materials

THE CONSERVATION of vital and strategic war materials made possible by the construction of Diesels instead of steam locomotives is clearly shown in the following comparisons:

(a) **192 TONS** of materials in the form of two 600 Hp. Diesel switchers will do the work of **420 TONS** of such materials in the form of three 6-wheel steam switchers.

(b) **240 TONS** of materials in the form of two 1000 Hp. Diesel switchers will do the work of **495 TONS** of such materials in the form of three 8-wheel steam switchers.

(c) **585 TONS** of materials in the form of two 4000 Hp. Diesel passenger locomotives will do the work of **1250 TONS** of such materials in the form of five modern steam passenger locomotives.

(d) **415 TONS** of materials in the form of one 5400 Hp. Diesel freight locomotive will generally do the work of **1200 TONS** of such materials in the form of four 4-8-4 modern steam freight locomotives, or **900 TONS** in the form of two Mallet steam locomotives.

MODERNIZE TO MOBILIZE WITH GM DIESELS

J. W. ANDERSON, general foreman of the Chicago & North Western at Winona, Minn., has retired.

H. W. CRAIG has been appointed supervisor of apprentices of the Erie, with headquarters at Cleveland, Ohio, succeeding L. A. Hartley, furloughed to accept a commission in the United States Army.

JAMES BEAN, who has become superintendent of shops of the Southern Pacific, at Los Angeles, Calif., as noted in the April issue, was born on August 23, 1895, at San Jose, Calif. Mr. Bean was graduated from the San Jose high school in 1915. He received an AB degree in mechanical engineering from Stanford University in June, 1922. In November, 1918,

James Bean

he had received the rank of ensign from the U. S. Navy Hydroplane school in New London, Conn. On August 6, 1923, he entered the service of the Southern Pacific as a draftsman in the office of mechanical engineer in San Francisco, Calif. He was appointed assistant engineer of tests and chief draftsman of the Los Angeles general shops in August, 1927, and superintendent of those shops on March 1, 1942.

C. C. ROBINSON has been appointed general foreman of the Chicago & North Western, with headquarters at Antigo, Wis.

F. BAUER, superintendent of the locomotive shops on the New York Central (Big Four) at Beech Grove, Ind., has retired from active service.

Car Department

H. A. BURBRIDGE has been appointed acting foreman on the Canadian National at Bathurst, N. B.

W. D. ELLIOTT has become car foreman of the Canadian National at Brick Shop, Moncton, N. B.

A. R. GREEN, general car inspector on the New York, Ontario & Western at Middletown, N. Y., has been appointed supervisor car maintenance at Middletown.

HARRY WILBUR has become auxiliary and car foreman on the Canadian National at Brick Shop, Moncton, N. B.

FRANK MARSH has become acting assistant foreman in the upholstery department, passenger car paint shop, at Moncton, N. B.

O. M. HASTINGS, general car foreman on the New York, Ontario & Western at Middletown, N. Y., has been appointed supervisor car shops with the same headquarters.

O. H. CLARK, general car inspector of the Gulf Coast Lines and the International-Great Northern (both parts of the Missouri Pacific system), with headquarters at Houston, Tex., has been appointed assistant superintendent of the car department of the Missouri Pacific Lines, with headquarters at St. Louis, Mo., succeeding F. E. Cheshire, who has been called to military service.

Purchasing and Stores

JOSEPH C. MCCAUGHAN, district storekeeper on the Chesapeake & Ohio at Richmond, Va., has been appointed general storekeeper at Huntington, W. Va.

JOSE F. ROMO, general storekeeper of the Mexico North-Western, has been appointed purchasing agent, with headquarters as before at Ciudad Juarez, Chih., a change of title.

J. L. QUARLES, general storekeeper of the Chesapeake & Ohio at Huntington, W. Va., has been appointed superintendent of stores of the Chesapeake & Ohio; the New York, Chicago & St. Louis and the Pere Marquette, with headquarters at Cleveland, Ohio.

Obituary

JAMES J. BARRY, assistant to superintendent motive power of the Norfolk & Western, with headquarters at Roanoke, Va., died on February 11 at the age of 68.

Trade Publications

Copies of trade publications described in the column can be obtained by writing to the manufacturers, preferably on company letterhead, giving title. State the name and number of the bulletin or catalog desired, when it is mentioned.

"HOW WORTHINGTON SERVES INDUSTRY."—Worthington Pump & Machinery Corporation, Harrison, N. J. Eleven-page staple-bound booklet gives a general view of Worthington's service to various industries, including the railroad industry.

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JOHNSON BRONZE. — Johnson Bronze Company, 1005 South Mill street, New Castle, Pa. Four-page bulletin descriptive of Johnson universal bronze bar stock.

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DIESEL-ELECTRIC LOCOMOTIVES. — Westinghouse Electric & Manufacturing Co., Pittsburgh, Pa. One-hundred-page spiral-bound catalog, in two colors; brief specifications and illustrations of Diesel-electric locomotives of 10 to 80 tons.

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BYERS GENERAL CATALOG, 1942.—A. M. Byers Company, Pittsburgh, Pa. Sixty-two-page spiral-bound catalog of wrought-iron, tubular and hot-rolled products; steel tubular products, and alloy steels.

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"HOW ONE COMPANY TACKLES THE WAR PRODUCTION PROBLEM."—Lyon Metal Products, Inc., Aurora, Ill. A step-by-step treatment of how the Lyon company set about to regain lost production, replacing peacetime products with war products.

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Motive power for the Southern's streamline train, "The Tennessean"